NACA

RESEARCH MEMORANDUM

PRESSURE DISTRIBUTIONS ON THREE BODIES OF REVOLUTION TO

DETERMINE THE EFFECT OF REYNOLDS NUMBER UP TO

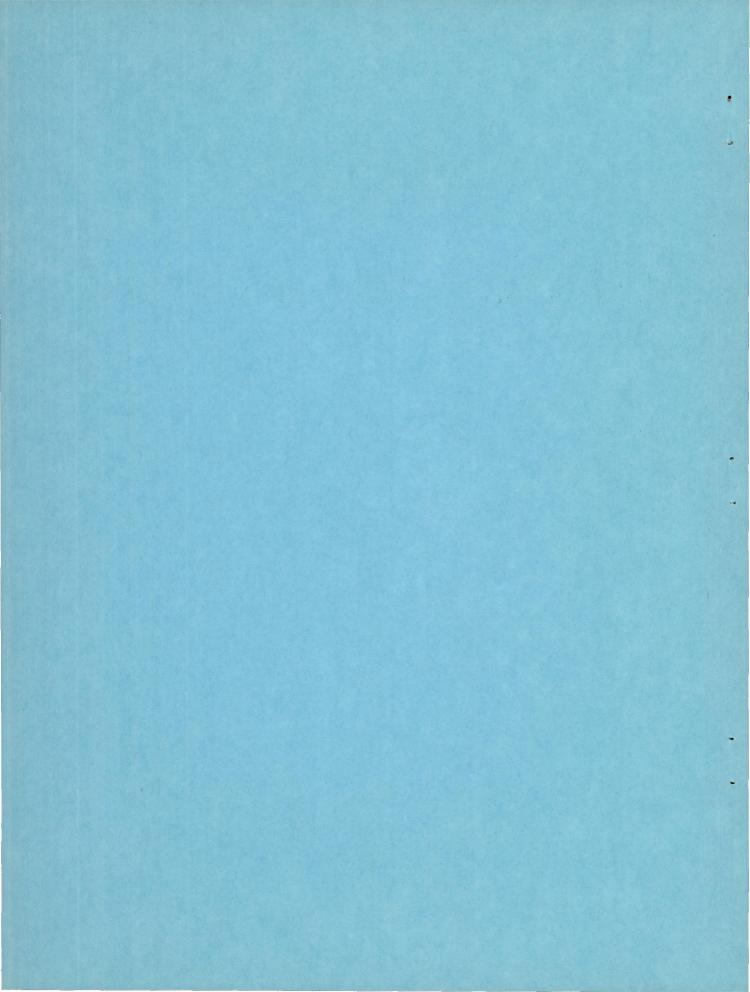
AND INCLUDING THE TRANSONIC SPEED RANGE

By John M. Swihart and Charles F. Whitcomb

Langley Aeronautical Laboratory
Langley Field, Va.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

WASHINGTON October 15, 1953



NACA RM L53H04

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

RESEARCH MEMORANDUM

PRESSURE DISTRIBUTIONS ON THREE BODIES OF REVOLUTION TO

DETERMINE THE EFFECT OF REYNOLDS NUMBER UP TO

AND INCLUDING THE TRANSONIC SPEED RANGE

By John M. Swihart and Charles F. Whitcomb

SUMMARY

This paper presents the results of an investigation conducted in the Langley 16-foot transonic tunnel to determine the effects of varying Reynolds number on the pressure distribution on a transonic body of revolution at angles of attack through the transonic speed range. The effect of a change in sting cone angle on the pressure distributions and a comparison of experimental incremental pressures with theory is also included.

The models were tested through a Mach number range from 0.60 to 1.09. The Reynolds number range based on body length was from 9×10^6 to 39×10^6 , and the cross-flow Reynolds number range based on maximum body diameter was 1.3×10^5 to 4.53×10^5 for the model at 8° angle of attack.

An increase in Reynolds number from 9×10^6 to 39×10^6 affected the longitudinal pressure distributions very slightly. These effects were of such a nature as to cause an increase of 0.05 in the normal-force coefficient of the body when tested in the subcritical cross-flow Reynolds number range. This increase is in agreement with theoretical approximations.

A comparison between experimental and theoretical values of the incremental pressure coefficient due to angle of attack indicated good agreement except at angles where separated flow areas existed over the body.

The effect of a change in sting-cone angle from 5° to 9° on the pressure distribution of the 120-inch model was negligible up to a Mach number of 1.05. At this Mach number the effect was to cause a small increase in the velocity over the rear of the body.

INTRODUCTION

Long slender bodies of revolution have been used for airships, fuselages, external stores, and more recently, for missiles. Tests of these bodies have been greatly accelerated because of their increased employment as aerodynamic shapes in the transonic and supersonic speed ranges. Some of the information available for several different bodies is reported in references 1 to 4. Some effects of Reynolds number on the pressure-distribution and force characteristics of the RM-10 missile at supersonic speeds are given in reference 1. Reference 2 presents the results of an investigation of the effects of cross-flow Reynolds number on the aerodynamic forces of bodies of different fineness ratio for various subsonic and supersonic Mach numbers.

Most of the previous investigations of the effects of Reynolds number on the flow over a body of revolution at high Mach numbers have been made with zero pitch attitude of the model. The purpose of the present investigation was to determine the effects of variations in both the longitudinal and cross-flow Reynolds numbers on the pressure distributions over a body of revolution at angles of attack from 0° to 15° for a Mach number range from 0.60 to 1.09. The sting-cone angle was changed from 5° to 9° in the presence of one body during the investigation, and the effects of this change on the pressures over the rear of the body are also discussed. An additional purpose of the investigation was to present an experimental check of a method shown in reference 5 for the calculation of the incremental pressure at any point on a slender body of revolution due to a change in body attitude from zero angle of attack. Reference 4 presents an experimental check of this method in the transonic Mach number range using a body tested at subcritical cross-flow Reynolds numbers. This paper presents a supercritical Reynolds number experimental check of the method.

Three transonic bodies of revolution with identical body profiles (except where modified for different sting supports) were tested in the Langley 16-foot transonic tunnel at angles of attack from -2° to 15° over a Mach number range from 0.60 to 1.09.

SYMBOLS

A maximum cross-sectional area, πR^2 , sq ft C_N normal-force coefficient, $\frac{N}{qA}$ body diameter, ft

| 7 | length, ft |
|-----|---|
| N | normal force, 1b |
| P | pressure coefficient, $\frac{p - p_0}{q}$ |
| ΔΡ | incremental pressure coefficient due to angle of attack |
| p | local static pressure, lb/sq ft |
| Po | free-stream static pressure, lb/sq ft |
| q | free-stream dynamic pressure, $\frac{1}{2}\rho V^2$, lb/sq ft |
| R | maximum radius of model, ft |
| r | radius at given station on model, ft |
| Re | free-stream Reynolds number, $\frac{\rho Vl}{\mu}$ based on body length |
| Rec | cross-flow Reynolds number, $\frac{\rho V \sin \alpha d}{\mu}$ based on body diameter |
| V | velocity, ft/sec |
| x | longitudinal distance from nose, ft |
| α | geometric angle of attack, deg |
| θ | meridian angle, measured from bottom of body, deg |
| μ | viscosity, slugs/ft-sec |
| ρ | mass density of air in free stream, slugs/ft3 |

APPARATUS

Langley 16-foot transonic tunnel. - A description of the Langley 16-foot transonic tunnel giving details of the slotted transonic test section is presented in reference 6. In this facility the test-section Mach number can be varied continuously from about 0.2 to 1.09 simply

by variation of drive power; no discontinuity in operation is experienced at sonic speed. Figure 1 is a downstream view of the test section of the Langley 16-foot transonic tunnel showing the 120-inch body installed.

Support strut.- Figure 2 is a sketch of the support configuration used in the investigation of the 120-inch body. The main support is a vertical cantilever strut of circular-arc section, capped with a 14-inch-diameter cylindrical body. The cone-shaped sting is faired into this cylinder. The angle of attack of the model is varied by rotation of the complete strut and sting assembly about a point on the longitudinal axis of the body. Figure 3(a) shows the details of the long and short cones with included angles of 5° and 9°, respectively, and the relative position of the 120-inch model to the center of rotation when mounted on either cone. This center of rotation is 96 inches behind the nose of the 120-inch body for the long cone and 60 inches behind the nose for the short cone.

Model dimensions .- The body profile is that of the standard fuselage of basic fineness ratio 12 used in the NACA transonic-wing research program. One model has a maximum diameter of 10 inches, 60 inches behind the nose. The rear of this model is faired into a 2-inch-diameter cylindrical sting section which reduces the length of the actual body below the basic length of 120 inches for a body of this diameter and fineness ratio (see fig. 3(a)). Reference 7, which presents test information obtained from this identical body at zero pitch attitude, has designated the model as a 120-inch body. Therefore, for clarity of reference, despite the above-mentioned sting fairing, this model is designated the 120-inch body. The second model is the same as the 120-inch body with the exception that it is cut off at 100 inches to provide for a heavier sting support. A sketch of this model, designated the 100-inch body, and its sting is shown in figure 3(b). The third model is one-third the size of the 100-inch body with a 33.33-inch actual or 40-inch basic length. Figure 3(b) shows the 33.33-inch body-sting combination and its relative position in the Langley 16-foot transonic tunnel compared with the 100-inch body. A table of nondimensional ordinates for the basic body is shown in figure 3(a). The orifice locations for the 120-inch, the 100-inch, and 33.33-inch bodies are given in figures 3(a) and 3(b), respectively. The basic length of the body is used to define the orifice location in each case.

Model construction.- The models are all metal and were maintained in an aerodynamically clean and smooth condition at all times. The surface ordinates of the 120-inch and the 100-inch bodies were essentially the same; however, they deviated from the design ordinates as indicated in figure 4. The maximum deviation was 0.02 inch between 14 and 17 percent of the length behind the nose, and the deviation was less than 0.008 inch from the specified ordinate over the rest of the body.

TESTS

Test conditions. The Mach number range covered in this investigation was from 0.60 to 1.09. The test data were obtained at constant tunnel Mach numbers as the angle of attack was varied from -2° to 15°. For the 120-inch body, the number of meridians at which longitudinal pressure distributions over the body were obtained was effectively doubled by rolling the model 22.5° from 0° roll at each test condition.

Figure 5 shows the Reynolds number of these tests. The ranges are 9×10^6 to 11×10^6 , 26×10^6 to 33×10^6 , and 31×10^6 to 39×10^6 for the 33.33-inch, 100-inch, and 120-inch bodies, respectively; all based on body lengths. The cross-flow Reynolds number ranged from 1.3×10^5 to 4.53×10^5 with the models at 8° angle of attack. For angles of attack above 8° , Re_c for the 33.33-inch body is in the critical range and below 8° Re $_c$ for the large body approaches the critical region; therefore, cross-flow was investigated at only 8° angle of attack. The free-stream relative humidity was at all times below the saturation point and generally varied from about 80 percent at the lower speeds to less than 30 percent at the maximum speed.

Instrumentation and accuracy of measurements. The locations of the the pressure orifices are shown in figure 3 for the 100-inch, 120-inch, and 33.33-inch bodies. The pressure orifices in the 120-inch body are located in 5 meridians of 21 orifices each, distributed longitudinally as shown. There were 4 orifice meridians on the 100-inch body and 6 orifice meridians on the 33.33-inch body. It should be noted that the $\theta = 75^{\circ}$ and 105° meridians did not extend the entire length of the 33.33-inch body because of space limitations. The pressure tubes from these orifices were conducted through the sting and strut, and thence to multiple-tube manometers. The pressure coefficients are estimated to be accurate to ± 0.005 . The angles of attack as presented are estimated to be accurate to $\pm 0.10^{\circ}$.

Tunnel-wall corrections.- There have been no tunnel-wall corrections applied to the data presented in this paper. Such corrections exclusive of reflected disturbances at supersonic speeds are believed to be negligible within the speed range of the investigation (see ref. 7).

RESULTS AND DISCUSSION

Presentation of pressure distributions. - Table I gives the pressure coefficients on the 120-inch body for 9 meridians and 21 axial positions. Pressure data on the 33.33-inch body was previously presented in reference 4

Comparisons of the pressure distributions along the 0° and 180° meridians of the bodies are depicted in figure 6 for angles of attack from 0° to 15° and Mach numbers from 0.60 to 1.09 as plots of pressure coefficient against fraction of body length. The slight discrepancies which occurred at x/l = 0.17 are attributed to local surface deviations of 0.023 inch over the two larger bodies as shown in figure 4. Tunnel boundary reflected disturbances also affected the distributions over the 120-inch body at the supersonic Mach numbers greater than 1.02 (no distributions were obtained over the 100-inch model in this range). These effects were observed at all angles of attack. A comprehensive investigation of these disturbances on bodies of revolution at zero angle of attack is included in reference 8. Reference 7 defines the extent of the effect of these disturbances on the pressure distributions over the 120-inch body at zero angle of attack in the Langley 16-foot transonic tunnel. Mild effects of these reflected interferences on the large bodies are noted in the vicinity of x/l = 0.35at a Mach number of 1.05. The reflected disturbances become stronger as the Mach number is increased. At a Mach number of 1.09, the disturbances cause an abrupt positive increase in the pressure coefficients of the 120-inch body at x/l = 0.44. These wall-reflected interferences appear to have little or no effect on the pressure distribution over the smaller 33.33-inch body in the Langley 16-foot transonic tunnel at Mach numbers of 1.05 and greater since the reflected disturbances pass downstream of the body at these tunnel velocities.

The expected pressure-recovery discrepancies between the 33.33-inch and 100-inch bodies and the 120-inch body are apparent in figure 6. The 33.33-inch and 100-inch bodies show an abrupt pressure recovery behind x/l = 0.75, whereas the 120-inch body shows a more gradual recovery farther downstream on the afterbody.

Effect of Reynolds Number On the Body Pressure Distributions

Longitudinal pressure distributions.— The effect of increasing the Reynolds number over body sections is to move the transition point from laminar to turbulent flow toward the nose of the body at subsonic speeds. This movement would increase the area of turbulent flow over the body surface and it would be expected that separation would be delayed to higher angles of attack. Such changes in the flow would be indicated in both the pressure distributions and force measurements obtained from the body. However, if a turbulent boundary layer exists over the entire body, no changes should be expected in the pressure distributions with increases in Reynolds number (for example, ref. 9).

Comparison of the pressure coefficients at the 0° and 180° meridians for the bodies in figure 6 show small differences in the subsonic speed range. Comparisons at the other meridian stations not included show similar results. Similar differences are shown in the supersonic speed

NACA RM L53HO4

range except in those regions where wall-reflected wave interferences intersect the large bodies. It is estimated that the boundary-layer flow over the two large bodies was almost completely turbulent since the Reynolds number was generally about 30×10^6 , and reference 10 shows that transition occurs at a Reynolds number of about 11×10^6 on a highly polished body. Reference 10 also showed no effect of Reynolds number at zero angle on the pressure distributions except in a region of adverse pressure gradient near the model base. Since very small differences in pressure coefficient occurred near the rearmost orifices of the 33.33-inch body when compared to the 100-inch body, it is estimated that the boundary-layer flow was turbulent in this region.

Because only slight variations in the pressure distributions along the body meridians were noted where comparisons were possible, it was believed that more significant differences might become apparent if the circumferential pressure coefficients were examined at stations along the body.

Circumferential pressure distributions.— When a body of revolution is rotated to an angle of attack, the cross section of the body presented to that component of the air stream normal to the longitudinal axis is a circular cylinder. It has long been known that an abrupt reduction in the pressure drag of cylinders occurs when the boundary layer changes from laminar to turbulent flow. If Re is below the critical values, there is laminar flow over the cylinder and separation of the boundary layer occurs near the maximum radius, however, if Re is above the critical value, turbulent flow exists and the boundary layer remains attached to the cylinder until near the rear stagnation point. Reference ll shows the critical Reynolds number range for a cylinder to be from 2×10^5 to 4×10^5 . Significant changes in the pressure distribution around the cylinder should be evident with the separated laminar flow yielding lower pressure coefficients.

Figure 7 shows the variation of pressure coefficient with meridian angle at x/l=0.10 for all the bodies at 8° angle of attack and Mach numbers of 0.60, 0.95, 1.00, and 1.02. The data for the 33.33-inch body from reference 4 are also presented. The x/l=0.10 station was chosen because the local cross-flow Reynolds number for all the bodies would be below the critical value. There is good agreement between the pressure coefficients for all the bodies at most meridian angles and Mach numbers. Figure 8 shows the circumferential pressures for two stations near the maximum diameter for all bodies at 8° angle of attack and at Mach numbers of 1.00 and 1.02. In this case the local cross-flow Reynolds number is above the critical range for the large bodies and below the critical range for the 33.33-inch body. The pressure distributions at x/l=0.36 and x/l=0.61 for a Mach number of 1.00 show that the small body is developing more negative pressures over the upper

NACA RM L53H04

surface $(\theta \ge 90^\circ)$. At a Mach number of 1.02 and x/l = 0.36 it appears that the pressure distributions of the large bodies and the 33.33-inch body in the Langley 8-foot transonic tunnel are being affected by slight boundary reflected over-expansions (see ref. 8) since the 33.33-inch body pressures of the present investigation are more positive at all meridian angles. At the same Mach number but at the more rearward body location of x/l = 0.6l, the distributions indicate no such interferences. The slotted-tunnel interference investigation of reference 8 made with this identical 33.33-inch body indicated that no local disagreement in pressure distributions should be anticipated at this body location at a Mach number of 1.02.

In general, it has been shown that the small changes in the axial distribution of pressure coefficients may be significant when examined in the light of the circumferential distributions around the body. Reference 3 indicated that the normal force of a body might be increased by an increment of cross-drag and that some differences might be expected between the forces of a body operated in subcritical and supercritical Rec. This expected difference in normal-force coefficient could be attributed to the change in cross-drag coefficient for a circular cylinder from 1.2 to about 0.3 when the critical cross-flow Reynolds number range was exceeded. Calculation of the normal-force coefficients for the 33.33-inch body and the 100-inch body by the method of reference 3 indicates that an increment of about 0.05 should be evident. The associated changes in drag and pitching moment are very small. Figure 9 shows the normal-force coefficient at 80 angle of attack for the 33.33-inch and 100-inch bodies at Mach numbers from 0.80 to 1.02. The values were obtained from integration of the pressure data, and the normal-force coefficients for the 33.33-inch body are from reference 4. The increase of about 0.05 in the normal-force coefficient of the small body over the 100-inch body which is in good agreement with the theoretical approximations is estimated to be the result of operating in a subcritical crossflow Reynolds number range as shown by the circumferential pressure distributions in figure 8.

Incremental pressure coefficients due to angle of attack. The gradual changes shown in the pressure coefficients even at the high subsonic and transonic Mach numbers encourage the use of a simple approach to the evaluation of the body-pressure distributions. Reference 5 presents a method for estimating the theoretical value of incremental pressure coefficients due to angle of attack on an inclined slender body of revolution. The basic assumption made in the application of this theory is that the crosswise flow on a slender inclined body of revolution may be treated simply by considering only the flow perpendicular to the body longitudinal axis. The variation in incremental pressure coefficients with the meridian angle for the 120-inch and 33.33-inch bodies at 80 nominal angle of attack and three Mach numbers is shown in figure 10. The theoretical curve for each case is obtained by the method of reference 5,

and the experimental values are shown for the indicated Mach numbers. The agreement between experimental values and theory is similar to that reported in reference 4 for the 33.33-inch body alone and these data substantiate the statements therein that this theoretical approximation is valid through the transonic speed range for unseparated flow. The theory of reference 5 was developed for the inviscid case and does not apply where separation over the body exists. Separation over the upper rear surface of the body is indicated by a break in the pattern, at a meridian angle near 90° , to an incremental pressure coefficient which tends toward zero. This can be clearly seen at x/l = 0.767 in figure 10.

Effect of change in sting-cone angle .- Figure 11 shows the pressure distribution along the 1800 meridian of the 120-inch body for the 50 and 9° sting-cone angles for 0° angle of attack and Mach numbers of 0.60, 0.95, 1.00, and 1.05. The change in sting-cone angle was coincident with a change in tunnel axial position of the model as shown in figure 3. For this reason, the very small axial changes in local velocity in the empty tunnel must be evaluated in addition to the local velocity changes on the body attributable to the change in sting-cone angle. The effect of the change in sting-cone angle from 5° to 9° and the coincident shift in tunnel axial position is very small. At the subsonic Mach numbers (0.60 and 0.95) the experimental data showed higher velocities over the rear portion of the body in the presence of the 5° cone which were fully explained by the change in axial position. At sonic speed the velocities were higher in the presence of the 9° cone which was again traced to the change in axial position. At a Mach number of 1.05, however, the change in axial position did not entirely explain the higher velocities on the afterbody in the presence of the 9° cone. The higher velocities in the presence of the 90 cone are opposite in sense to the difference expected from a theoretical consideration of the subsonic flow ahead of two different cones. The maximum difference in pressure coefficient is only 0.025 at a Mach number of 1.05, but it serves to emphasize that stingsupport systems should be kept as small as possible with their maximum diameter far behind the model.

CONCLUSIONS

The investigation of three slender bodies of revolution at angles of attack from -2° to 15° through a Mach number range of 0.60 to 1.09 has led to the following conclusions:

1. Reynolds number had a small effect on the axial pressure distributions of these slender bodies of revolution for the range of the variables investigated.

2. The decrease in the body normal-force coefficient when increasing the cross-flow Reynolds number above the critical range is in agreement with theoretical approximations.

- 3. Existing theory for calculation of incremental pressure coefficients on a slender body of revolution operating at angle of attack yields results which are in good agreement with experiment except in areas of separated flow.
- 4. The effect of a change in sting-cone angle from 5° to 9° and a coincident change in tunnel axial position on the pressure distribution was negligible up to a Mach number of 1.05.

Langley Aeronautical Laboratory,
National Advisory Committee for Aeronautics,
Langley Field, Va., August 11, 1953.

REFERENCES

- 1. Perkins, Edward W., Gowen, Forrest E., and Jorgensen, Leland H.:
 Aerodynamic Characteristics of the NACA RM-10 Research Missile
 in the Ames 1- by 3-Foot Supersonic Wind Tunnel No. 2 Pressure
 and Force Measurements at Mach Numbers of 1.52 and 1.98. NACA
 RM A51G13, 1951.
- Allen, H. Julian, and Perkins, Edward W.: Characteristics of Flow Over Inclined Bodies of Revolution. NACA RM A50L07, 1951.
- 3. Allen, H. Julian: Estimation of the Forces and Moments Acting on Inclined Bodies of Revolution of High Fineness Ratio. NACA RM A9126, 1949.
- 4. Estabrooks, Bruce B.: An Analysis of the Pressure Distribution Measured on a Body of Revolution at Transonic Speeds in the Slotted Test Section of the Langley 8-Foot Transonic Tunnel. NACA RM L52D2la, 1952.
- 5. Allen, H. Julian: Pressure Distribution and Some Effects of Viscosity on Slender Inclined Bodies of Revolution. NACA TN 2044, 1950.
- 6. Ward, Vernon G., Whitcomb, Charles F., and Pearson, Merwin D.: Air-Flow and Power Characteristics of the Langley 16-Foot Transonic Tunnel. NACA RM L52E01, 1952.
- 7. Hallissy, Joseph M., Jr.: Pressure Measurements on a Body of Revolution in the Langley 16-Foot Transonic Tunnel and a Comparison With Free-Fall Data. NACA RM L51L07a, 1952.
- 8. Ritchie, Virgil S., and Pearson, Albin O.: Calibration of the Slotted Test Section of the Langley 8-Foot Transonic Tunnel and Preliminary Experimental Investigation of Boundary-Reflected Disturbances. NACA RM L51K14, 1952.
- 9. Jacobs, Eastman N., and Sherman, Albert: Airfoil Section Characteristics As Affected by Variations of the Reynolds Number. NACA Rep. 586, 1937.
- 10. Czarnecki, K. R., and Marte, Jack E.: Skin-Friction Drag and Boundary-Layer Transition on a Parabolic Body of Revolution (NACA RM-10) at a Mach Number of 1.6 in the Langley 4- by 4-Foot Supersonic Pressure Tunnel. NACA RM L52C24, 1952.
- 11. Stack, John: Compressibility Effects in Aeronautical Engineering. NACA ACR, Aug. 1941.

TABLE I

(a) M = 0.60.

| | | | | α = | -2.1° | | | | | | | | | $\alpha = 4$ | .10 | | | | |
|-------|--------------|---------|--------|--------------|--------|--------------|---------------|---------------|--------------|-------|--------------|--------------|--------|--------------|--------------|--------------|--------|--------|-------|
| x/l | A | В | С | D | E | F | G | н | I | x/l | A | В | С | D | Е | F | G | н | I |
| .017 | 0.0959 | | 0.0928 | 0.1044 | 0.1200 | 0.1337 | | 0.1576 | | | 0.1825 | 0.1718 | | 0.1352 | | | 0.0768 | 0.0749 | 0.074 |
| .033 | .0578 | .0568 | .0637 | .0660 | | .0879 | .1037 | .1081 | .1109 | .033 | .1333 | .1316 | .1115 | .0914 | .0658 | .0530 | .0439 | .0365 | .030 |
| .067 | .0087 | .0092 | .0164 | .0165 | .0309 | .0348 | .0491 | .0531 | .0527 | .067 | .0456 | .0713 | .0384 | .0128 | 0018 | 0164 | 0201 | 0219 | 02 |
| .100 | 0240 | | 0309 | 0238 | 0109 | | 0091 | .0073 | .0127 | .133 | .0274 | .0110 | 0037 | 0110 | 0256 | 0311 | 0347 | 0365 | 036 |
| .167 | 0567 | 0605 | 0527 | 0550 | 0437 | 0403 | 0273 | 0238 | 0200 | .167 | 0110 | 0146 | 0292 | 0457 | 0585 | 0640 | | 0621 | |
| .233 | 0676 | | | 0715 | 0618 | 0568 | 0455 | 0495 | 0437 | .233 | 0383 | 0384 | 0475 | 0658 0676 | 0749 0749 | | 0749 | 0713 | |
| .300 | 0621 | 0641 | | 0696 0641 | 0582 | 0605 | 0509 | 0495 | 0546 | | 0460 | 0439 | | 0658 | 0694 | 0694 | 0658 | 0603 | 05 |
| .367 | 0603 | 0641 | | | 0637 | | 0564 | 0605 | 0546 | | 0529 | 0548 | | 0713 | 0731 | 0694 | 0640 | 0603 | 06 |
| .500 | 0603 | 0641 | | 0715 | 0655 | 0696 | 0618 | 0660 | 0582 | .500 | 0602 | 0621 | 0676 | 0768 | 0749 | -:0731 | 0640 | 0603 | |
| .567 | 0548 | 0550 | 0527 | 0623 | 0564 | 0641 | 0564 | 0623 | 0546 | | 0602 | 0603 | | 0694 | 0676 | 0621 | 0530 | 0512 | |
| .633 | 0567 | 0623 | 0582 | 0660 | 0637 | | | | 0655 0691 | .633 | 0730 0785 | 0731 0768 | | 0768 | 0713 | 0676 0603 | 0567 | 0457 | 04 |
| .700 | 0494 | | | 0641 | | 0715 | 0673 | | | .733 | 0675 | 0694 | 0676 | 0640 | 0530 | 0420 | 0329 | 0292 | |
| ·733 | 0058 | 0128 | 0091 | 0202 | | 0330 | | 0403 | 0327 | .767 | 0456 | 0475 | 0439 | 0365 | 0238 | 0146 | 0073 | 0054 | 00 |
| .800 | .0214 | .0183 | .0200 | .0073 | .0091 | 0 | .0018 | 0055 | | .800 | 0164 | 0146 | 0091 | 0055 | .0073 | .0183 | .0238 | .0256 | .02 |
| .833 | .0432 | .0421 | .0455 | .0348 | .0382 | .0311 | .0309 | .0202 | .0255 | .833 | .0128 | .0146 | .0201 | .0256 | .0365 | .0439 | .0457 | .0439 | .04 |
| .867 | .0632 | .0623 | .0673 | .0605 | .0618 | .0531 | .0564 | .0495 | .0527 | .867 | .0402 | .0439 | .0493 | .0567 | .0621 | .0621 | .0932 | .0914 | .09 |
| .900 | .0959 | .0934 | .0982 | .0934 | .0982 | .0934 | | .0971 | .1019 | .933 | .1077 | .1042 | .1005 | .0950 | .0932 | .0914 | .0932 | .0932 | .09 |
| | | | | | | | | | | | | | | | .00 | | | | |
| | | | | α. | = 00 | | | | | - | | | | α = 6 | 1 | | | | |
| .017 | 0.1187 | 0.1154 | 0.1170 | 0.1228 | 0.1224 | 0.1283 | 0.1279 | 0.1319 | 0.1334 | | | | | 0.1209 | | | | 0.0476 | 0.04 |
| .033 | | .0843 | .0841 | | | | | | | .033 | .1633 | .1539 | .1139 | | .0404 | .0238 | | .0165 | |
| .067 | .0256 | | .0329 | .0311 | .0329 | .0330 | | .0366 | .0365 | .067 | .0991 | .0898 | .0551 | .0202 | 0110 | 0220 | 0257 | 0103 | 02 |
| .100 | .0073 | .0165 | .0183 | .0147 | .0146 | .0092 | | .0073 | | .133 | .0459 | .0257 | 0055 | 0238 | 0496 | 0531 | 0551 | 0513 | 05 |
| .167 | | | 0420 | | | 0403 | 0384 | 0348 | | .167 | .0073 | 0018 | 0294 | 0586 | 0809 | -,0006 | 0845 | 0733 | 07 |
| .233 | 0602 | 0550 | 0548 | 0586 | 0585 | 0550 | 0548 | 0550 | 0548 | .233 | 0239 | 0275 | 0533 | 0788 | 0956 | | 0900 | 0788 | |
| .300 | | | | 0586 | 0585 | 0568 | | | 0548 | .300 | 0330 | 0366 | | | 0956 | 0898 | 0809 | 0678 | |
| .433 | 0556 0584 | | | | | 0550 0586 | 0548 | 0513 | 0512. | .367 | 0401 | 0421 | | | 0956 | 0843 | 0735 | 0623 | |
| | 0621 | 0623 | 0621 | 0623 | 0621 | 0623 | 0621 | 0605 | | . 500 | 0587 | 0623 | 0790 | 0934 | 0974 | 0843 | 0698 | 0605 | 05 |
| .567 | 0584 | 0550 | 0548 | | 0548 | 0623 0550 | 0548 | 0550 | 0548 | .567 | | | | 0861 | 0882 | 10733 | 0588 | 0513 | 04 |
| .633 | 0639 | 0623 | 0621 | | | | | 0623 | | .633 | | 0770 | | | 0900 | 0733 | 0588 | 0531 | |
| | 0602 | | 0505 | 0605 | 0621 | 0623 | | 0458 | 0621 | .700 | | 0843 | | 0806 | 0662 | | 0331 | 0293 | |
| .767 | 0438 | 0183 | 0183 | | | | | | | .767 | 0569 | 0605 | | | 0331 | | 0092 | 0073 | 00 |
| .800 | .0128 | | .0110 | | | | | .0110 | .0110 | .800 | 0294 | 0257 | 0257 | 0183 | .0018 | | .0184 | .0202 | |
| .833 | .0365 | .0385 | .0384 | .0366 | .0365 | .0385 | .0384 | .0348 | .0365 | .833 | 0018 | .0018 | | | .0331 | .0403 | | | |
| .867 | ,0602 | .0623 | .0640 | | | | .0621 | .0605 | .0621 | .867 | .0257 | .0311 | | | .0570 | | .0551 | .0550 | |
| .900 | | .0989 | .0987 | | .0987 | .0989 | | .0989 | | .900 | | | | | | | .0919 | | .10 |
| • 933 | 1140 | 1.0,0, | .100) | | | | | 1.,,, | 1 | 700 | | | | | | | | | |
| | | | | α = | 2.00 | | | | | | | | | α = | | | | | |
| | 0.1475 | | | 0.1316 | 0.1225 | | 0.1024 | 0.1042 | 0.1005 | 0.017 | | 0.2230 | 0.1612 | 0.1042 | 0.0458 | 0.0201 | 0.0110 | 0.0201 | 0.02 |
| .033 | | | | .0914 | .0804 | | | | | .033 | .1995 | .1773 | | | 0385 | - 0403 | - 0105 | 0347 | 0 |
| .067 | .0455 | .0512 | | | .0091 | | 0055 | | | .100 | | .087 | | 0146 | 0513 | 0658 | 0623 | 0493 | 0 |
| .133 | | | 0110 | 0091 | 0146 | 016 | 40183 | 0201 | 0238 | .133 | .0750 | .0420 | - 0037 | 1 0402 | 0733 | 10786 | 0715 | 0621 | 0 |
| .167 | 0310 | 0311 | 0347 | 7 0402 | 0475 | 0512 | 2 0530 | 0493 | 0512 | | .0329 | .0146 | 0293 | 0749 | 1044 | 1078 | 0989 | 0822 | 0 |
| . 233 | 0528 | | 0530 | 0621 | 0640 | | 0658 | | 0676 | .233 | | 0146 | 06/17 | 1005 | - 1191 | 1078 | 0861 | 0713 | |
| .300 | 0528 | | | | 0640 | 062 | 10640 | | | .300 | 0126 | | 7 0678 | 3 0987 | 1136 | 1023 | 3 0788 | 0640 | |
| .433 | | | 0603 | 3 0640 | 0640 | 062 | 1 0640 | -: 0621 | 0640 | .433 | 0329 | 0475 | 0788 | 1060 | 1173 | 0987 | 0751 | 0640 | 0 |
| .500 | 0637 | 0640 | 0658 | 0694 | 0676 | 0676 | 6 0640 | 0640 | 0640 | .500 | 0458 | 0585 | 0861 | 1115 | 1173 | 0969 | 0715 | 0621 | |
| .567 | | | | | | 0585 | 056 | 0548 | | .567 | 0494 | 0603 | 0861 | 1042 | 1063 | 0804 | 0586 | 0546 | |
| .633 | | 0694 | | 5 0676 | 0658 | 060 | 00603 3056 | 0603 70548 | | 700 | 0824 | 087 | 7 1063 | 1151 | 0989 | 060 | 0513 | 0530 | 0 |
| .700 | 0583 | 0603 | | 7 0530 | 0494 | 045 | 7 0402 | 0384 | | .733 | 0750 | 0859 | 1008 | 3 0987 | 0733 | 310365 | 0348 | 0365 | 0 |
| .76 | 0346 | 0365 | 0311 | 1 027 | +0219 | 018 | 3 0146 | 0128 | 0110 | .76 | 0586 | 0676 | 0770 | 0676 | 0348 | 0110 | | | |
| .800 | 005 | 0018 | .0018 | | | .012 | 016 | .0183 | | | | | | | .0037 | 0164 | | .0091 | |
| .833 | 0492 | .0271 | .027 | | | | | | | .833 | | | | | | | | | 3 .0 |
| | 1 . 0492 | .0530 | | 7 .056 | | | | | | .900 | | | | | .0953 | .0950 | | | .0 |
| .86 | | 7 .0050 | 0060 | 0950 | 095 | .095 | 01 .096 | | | . 900 | .000 | | .001 | | | 1 .07 | | | |
| .86 | .094 | | 0.0969 | | .095 | | | | | .933 | 1299 | | 3 .104 | | | .0950 | | | 5 .1 |

NACA

TABLE I .- Continued

(b) M = 0.80.

| | | | | α = | -2.2° | | | | | | | | | α = | 4.10 | | | | |
|---|--|--|--|--|--|--|--|---|--|---|--|--|---|--|--|---|---|--|---|
| x/l | A | В | С | D | E | F | G | Н | I | x/l | A | В | С | D | E | F | G | Н | I |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .767 .800 .833 .867 .900 | .0759 .0234 .0039 0156 0523 0645 0596 0549 0571 | .0758 .0250 .0102 0270 0555 0654 0617 0555 0629 0629 | .0834 .0308 .0149 0242 0511 0634 0597 0548 0609 0621 0536 0609 | .0312 .0114 0134 0530 0679 0667 0692 0679 0654 0654 | .1006 .0418 .0235 -0034 -0438 -0609 -0609 -0669 -0634 -0683 -0597 -0670 -0683 -0499 | .1068 .0498 .0315 .0052 0369 0568 0580 0580 | 0.1789 1238 .0639 .0382 .0186 -0279 -0475 -0497 -0585 -0695 -0732 -0585 -0732 -0585 -0732 -1116 .0382 .0651 .1116 | .1316 .0721 .0449 .0213 0171 0444 | 0609 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .707 .800 .833 .867 .900 | .1586 .0916 .0660 .0404 .0022 0363 0415 0473 0570 0570 0716 | 0553 0701 0763 0677 | .1335 .0724 .0491 .0064 0254 0474 0523 | 0.1719 1188 0.595 0336 0077 -0356 -0578 -0615 -0566 -064 -0714 -0664 -0738 -0813 -0813 -0343 .0015 -0343 .0111 | .0895 .0308 .0088 0156 0548 0719 0670 0731 0768 0670 0743 0743 | .0756 .0262 .0032 0158 0553 0701 0677 0652 0677 0714 | 0548 0584 0523 0315 | | .0601 |
| | | | | α = | -0.1° | | | | | | | | | a = 6 | 5.2° | | | | |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .767 .800 .833 .867 .900 | 0.1385 .0969 .0386 .0174 0034 0414 0597 0585 0599 0597 0648 0597 0475 0193 .0149 .0431 .0700 .1079 | .0975 .0439 .0252 0135 0434 0583 0571 0533 0621 | 0575 0538 0625 0636 0575 0661 0636 | .0987 .0439 .0214 0022 0446 0668 0621 0571 0646 0670 0596 0670 0695 0508 | 0.1500 .1034 .0445 .0223 .0022 .0415 .0599 .0611 .0562 .0624 .0685 .0513 .0206 .0138 .0420 .0420 .0691 .10583 | 0.1535 .1012 .0464 .0237 .0040 0583 0571 0670 0583 0673 0695 0508 | 0.1562 .1034 .0469 .0052 -0378 -0575 -0575 -0562 -0611 -0661 -0587 -0673 -0673 -0513 -0231 .0150 .0445 .0690 .1095 .1083 | .1049 .0489 .0177 .0015 0346 0575 0558 0521 0621 | 0.1574 .1071 .0528 .0174 .0015 -0317 -0526 -0526 -0513 .0636 -05775 -0673 -0685 -05031 .0138 .0420 .0702 .1095 .1083 | .033 .067 .100 .133 .167 | .1927 .1208 .0928 .0648 .0210 0132 | 0.2344 .1797 .1112 .0851 .0403 .0067 -0219 -0331 -0356 -0605 -0791 -0891 -0891 -0605 -0219 .0080 .0403 .0963 .1249 | 0.1873 .1445 .0785 .0540 .0100 -0218 -0474 -0535 -0548 -0756 -0719 -0878 -0932 -0572 -0166 .0540 .1078 .1176 | .1075 .0453 .0217 0057 0493 0729 0791 | 0.1127 .0663 .0088 -0095 -0340 -0731 -0902 -0829 -0902 -0927 -0902 -0878 -0853 -0609 -0242 .0161 .0467 .0711 .1054 | .0428 0057 0233 0443 0829 0966 0916 0879 0903 0916 0791 0816 0717 | .0357 0083 0267 0413 0768 0743 0682 0670 0670 0572 0572 0487 | 0.0677 .0316 -0070 -0306 -0468 -0767 -0816 -0704 -0655 -0667 -0530 -0530 -0530 -0530 -0500 -0070 0029 0416 .0602 .0951 .1075 | 0.0760 .0381 .0002 -0230 -0364 -0658 -0719 -0535 -05408 -0438 -0487 -0413 -0218 .0015 .0296 .0491 .0663 .0993 .1200 |
| | | | | α = | 2.00 | | | | | | | | | a = 8 | 3.40 | | | | |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .700 .733 .800 .833 .867 .900 | 0.1735 .1271 .0625 .0405 .0161 .0242 .0473 .0502 .0595 .0717 .0754 .0571 .0399 .0344 .0637 .0391 .0314 | .1310 .0706 .0508 .0089 0220 0417 0441 0429 0553 0590 0553 | 0.1628 .1213 .0614 .0406 .0902 .0915 .0499 .0511 .0499 .0594 .0707 .0760 .0291 .0100 .0394 .0687 .1103 | 0.1656 .1150 .0558 .0348 .0089 -0343 -0540 -0553 -0691 -0565 -0651 -0701 -0528 -0232 .0113 .0422 .0706 .1113 .1125 | .1029 .0418 .0210 0034 0438 0609 0572 0633 0658 0584 0658 | 0.1471 .0952 .0392 .0156 .0002 .0559 .0590 .0553 .0590 .0639 .0553 .0627 .0614 .0429 .0133 .0237 .0521 .0755 .1113 .1100 | 0.1359 .0858 .0333 .0076 0487 0487 0621 0609 0572 0609 0584 0598 0598 0598 0584 0389 0120 .0247 .0736 .0736 .1090 .1078 | .0878 .0385 .0076 0072 0417 0590 0516 0503 0565 0590 0590 0577 0540 0343 | 0.1286 .0834 .0333 .0051 .0120 .0462 .0560 .0555 .0584 .0584 .0560 .0340 .0750 .0340 .0750 .0760 | .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 | .2235 .1479 .1174 .0881 .0429 .0039 -0071 -0152 -0278 -0425 -0473 -0693 -0839 -0754 | 0.2689 .2105 .1372 .1098 .0614 .0278 0194 0430 05542 0554 0778 0902 0877 0678 0306 .0017 .0328 .0937 .1384 | .1483 .0786 .0529 .0076 0242 0524 0622 0634 0793 0867 1026 1111 | .0987 .0340 .0092 -0181 -0616 -0877 -0952 -0927 -1039 -1101 -1064 -1163 -1238 -1064 -0728 | .0345 0206 0401 0634 1013 1185 1111 1173 1185 1075 1087 1013 | 0728 1088 1200 1138 1076 1076 0915 0890 0716 0442 | .0064 0328 0499 0610 0952 0977 0842 0769 0720 0707 0585 0597 0524 | 0852 0741 0654 0678 | .0174 0132 0353 0487 0744 0769 0622 0548 |

TABLE I .- Continued

(c) M = 0.90.

| | | | | α = - | 2.30 | | | | | | | | | α, = | 4.10 | | | | |
|---|--|--|--|--|--|---|---|--|--|---|---|---|---|--|---|---|--|--|---|
| x/l | A | В | С | D | Е | F | G | Н | I | x/z | A | В | С | D | Е | F | G | Н | I |
| 0.017 .033 .067 .100 .133 .300 .367 .433 .500 .763 .700 .733 .767 .800 .833 .867 .900 | 0.1315 .0900 .0288 .0103 0127 0553 0640 0673 0687 0673 0640 0411 0083 .0288 .0561 .0802 .1140 | 0.1325 .0919 .0319 .0173 .0222 .0584 .0670 .0670 .0670 .0682 .06827 .0094 .0301 .0567 .0823 .1143 | 0.1416 .0957 .0394 .0215 -05645 -0685 -0696 -0598 -0707 .0663 -0138 .0267 .0552 .0803 .1154 .1121 | 0.1527 .1037 .0429 .0215 .0062 .0531 .0712 .0712 .0718 .0734 .0638 .0734 .0744 .0499 .0158 .0226 .0525 .0727 .0727 .0727 .0727 | 0.1679 .1165 .0552 .0300 .0026 -0466 -0674 -0663 -0598 -0751 -0663 -0751 -0662 -0806 -0587 -0806 -0587 -0158 .0475 .0782 .0478 | 0.1826 .1250 .0621 .0354 .0130 -0382 -0606 -0595 -0680 -0734 -0659 -0798 -0830 -0606 -0307 -0141 .0471 .0749 1186 | 0.1986 .1405 .0760 .0461 .0245 .0558 .0558 .0532 .0718 .0620 .0718 .0692 .0795 .0849 .0652 .0357 .0070 .0420 .0705 .1176 | 0.2061 .1485 .0823 .0450 .0269 -0190 -0478 -0520 -0478 -0616 -0680 -0627 -0798 -0872 -0638 -0371 -0055 .0365 .0365 .0365 .0365 | 0.2106 .1526 .0924 .0530 .0311 -0138 -0423 -0412 -0457 -0576 -0674 -0620 -0773 -0860 -0641 -0390 .0037 .0366 .0694 .1176 .1165 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .767 .800 .833 .867 .900 | 0.2336 .1769 .1007 .0734 .0462 .0017 .0399 .0437 .0497 .0617 .0606 .0802 .0911 .0828 .0464 .0050 .0288 .0603 .1170 .1279 | 0.2251 .1750 .1047 .0780 .0322 .0072 .0339 .0403 .0552 .0616 .0558 .0765 .0851 .0712 .0446 .0009 .0333 .0663 .1185 .1271 | 0.2035 .1511 .0845 .0583 .0146 -0247 -0531 -0509 -0662 -0716 -0672 -0836 -0902 -0727 -0432 -015 .0305 .0714 .1194 .1205 | 0.1953 .1377 .0674 .0407 .0141 -0360 -0605 -0637 -0773 -0765 -0691 -0808 -0893 -0699 -0339 -0777 .0428 .0791 .1185 .1175 | 0.1566 .1052 .0452 .0190 .0061 .052 .0749 .0738 .0672 .0771 .0803 .0705 .0803 .0825 .0214 .0201 .0528 .0812 .1162 | 0.1473 .0972 .0354 .0077 -0104 -0573 -0744 -0691 -0744 -0637 -0723 -0691 -0446 -0094 -0311 .0610 .0834 1175 | 0.1282 .0779 .0291 .0021 .0159 -0629 -0760 .0683 -0640 -0642 -0640 | 0.1271080203220013017905730605060506160509059505410296 .0375 .0610 .0823 .1143 | 0.11; .07i .02e .00i .05i .05i .05i .05i .05i .05i .05i |
| | | | | at = | = -0.1° | RIE! | | | | | | | | α = | 6.2° | | | | |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .567 .433 .500 .567 .633 .760 .733 .767 .800 .833 .867 .903 | 0.1620 .1151 .0485 .0277 .0421 -0629 -0596 -0618 -0618 -0749 -0749 -07520 .0203 .0190 .0496 .0779 .1172 .1151 | 0.1636 .1198 .0579 .0365 .0041 0414 0581 0574 0563 0660 0585 0713 0713 07510 0190 .0226 .0525 .0814 .1198 .1177 | 0.1635 .1164 .0562 .0344 -06072 -0444 -0608 -0597 -0543 -0663 -0685 -0619 -0740 -074 | 0.1732 .1219 .0589 .0333 .0077 -0404 -0606 -0532 -0638 -0671 -0596 -0703 -0745 -0510 -0190 .0194 .0792 .1177 .1177 | 0.1711 .1197 .0584 .0322 .0059 -0433 -0630 -0554 -0663 -0707 -0619 -0729 -0772 -0554 -0225 .0158 .0475 .0173 .0475 .0153 | 0.1785 .1219 .0611 .0290 .0130 0564 0574 0564 0564 0671 0585 0713 0735 0510 0211 .0205 .0736 .0792 .1198 | 0.1766 .1197 .0584 .0313 .0114 -03797 -0597 -0641 -0777 -0619 -0751 -0772 -0554 -0247 .0179 .0497 .0179 .0497 .0179 | 0.1817 .1273 .0675 .0301 .0098 -0318 -0553 -0551 -0510 -0666 -0660 -0585 -0724 -0745 | 0.1766 .1230 .0661 .0278 .0103 .0335 .0532 .0532 .0530 .0696 .0619 .0751 .0783 .0543 .0544 .0710 .1175 .1131 | 0.017 .033 .067 .100 .133 .167 .233 .300 .567 .433 .500 .567 .633 .767 .800 .833 .867 .900 | 0.2618 .2014 .1234 .0916 .0608 .0114 -0259 -0347 -0418 -0633 -0655 -0874 -1028 -0633 -0248 .0114 .0411 .1026 | 0.2491 .1947 .1220 .0921 .0045 -0378 -0378 -0575 -0671 -0660 -0874 -0991 -0885 -0190 .0152 .0494 .1060 .1316 | 0.2054 .1547 .0809 .0544 .0071 -0304 -0580 -0657 -0646 -0822 -0899 -0866 -10142 -1130 -0987 -0690 -0227 .0137 .0533 .1073 .1172 | 0.1797 .1220 .0547 .0269 -0019 -0521 -0788 -0853 -0788 -0997 -1096 -1141 -0906 -0553 -0105 -0112 -0112 -0563 -0112 -0563 -0112 -0563 -0112 | 0.1260 .0732 .0115 -0117 -0381 -0855 -1042 -0965 -1053 -1053 -1053 -1078 -0778 -0337 .0104 .0688 .1062 | 0.1113 .0611 .0045 -0222 -0393 -0874 -1013 -0949 -0966 -0927 -0959 -0821 -0874 -0758 -0126 .0248 .0515 .0739 .1103 .1092 | 0.0886 .0412 -0073 -0290 -0458 -0888 -0976 -0877 -0811 -0822 -0690 -0734 -0669 -0139 .0214 .0445 .0643 -0139 .0214 .0445 .0643 .0139 | 0.0942 .0504 .0077 -0222 -0393 -0767 -0841 -0665 -0692 -0596 -0361 -0073 .0248 .0451 .0665 .1028 .1167 | 0.083 .043 .000 .024 .043 .080 .086 .065 .069 .058 .058 .058 .058 .001 .007 .024 .044 |
| | | | | α = | 2.0° | | | | | | | | | α = | 8.40 | | | | |
| 0.017 .033 .067 .100 .133 .300 .367 .433 .500 .763 .760 .733 .767 .800 .833 .867 .900 | 0.1919 1394 .0694 .0442 .0201 .0269 .0543 .0543 .0560 .0665 .0652 .0871 .0376 .0672 .1164 | 0.1925 .1444 .0771 .0536 .0098 -0286 -0511 .0532 -0500 -0639 -0628 -0788 -0831 .0866 -0361 .0077 .0397 .0718 .1177 | 0.1816 .1322 .0696 .0466 .0026 -0336 -0556 -0556 -0523 -0654 -0709 -0643 -0325 .0103 .0411 .0729 .1179 | 0.1840 .1306 .0622 .0365 .0109 -0393 -0618 -0564 -0682 -0724 -0650 -0767 -0831 -0618 -0276 .0120 .0140 .0750 .1156 | 0.1662 .1135 .0509 .0279 .0015 0468 06676 0599 0698 0753 0753 0753 0758 0.0266 .01588 .0477 .0762 .1146 | 0.1637 .1081 .0494 .0194 .0013 .0479 0671 0650 0618 0671 0714 0628 0735 0735 0735 0511 0190 .0226 .0536 .0782 .1167 | 0.1520 .0971 .0422 .0150 .0029 -0512 -0676 -0676 -0709 -0709 -0687 -0457 -0457 -0457 -0149 .0268 .0553 .0784 .1157 | 0.1509 .0996 .0451 .0120 .0073 -0489 -0671 -0618 -0575 -0660 -0703 -0682 -0425 -0145 .0280 .0547 .0814 .1156 | 0.1432 .1157 .0400 .0059 .0059 -0512 -0667 -0676 -0578 -0676 -0676 -0665 -0413 -0105 .0290 .0542 .0795 .1124 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .767 .800 .833 .867 .900 | .2413 .1603 .1264 .0935 .0431 .0004 0116 0232 0335 0488 | 0.2797 .2218 .1437 .1126 .0634 .0216 -0137 -0287 -0319 -0522 -0640 -0662 -0897 -1047 -0983 -0769 -0319 .0045 .0377 .1019 | 0.2169 .1641 .0883 .0609 .0114 -0259 -0567 -0666 -0677 -0853 -0951 -0929 -1127 -1226 -1105 -0809 -0336 .0070 .0499 .1301 | 0.1672 .1084 .0377 .0088 .0201 .0694 .0983 .1069 .1004 .1154 .1218 .1154 .1293 .1379 .1379 .1379 .0266 .0206 .0666 .1148 | 0.0982 .0477 -0127 -0358 -0611 -1083 -1259 -1248 -1129 -1281 -1138 -1193 -1193 -1197 -0787 -0292 .0180 .0477 .0740 .1158 | 0.0730 .0227 -0298 -0544 -1165 -1283 -1133 -1143 -0961 -0790 -0148 .0206 0495 .0719 -0719 -0719 | 0.0620 .0180 -0259 -0444 -0589 -1006 -1050 -0897 -0809 -0798 -0766 -0666 -0699 -0622 -0402 -0105 .0244 0466 .0686 .1114 | 0.0655 .0248 -0126 -0394 -0544 -0897 -0919 -0769 -0747 -0758 -0683 -0769 -0737 -0501 -0244 0088 0323 .0591 .1073 | 0.062 -026 -033 -047 -082 -081 -061 -061 -061 -055 -025 -025 -025 -038 -038 -038 -038 -038 -038 -038 -038 |

NACA

TABLE I .- Continued

(d) M = 0.95.

| | | | | α = | = -2.3° | | | | | 1 | | | | α = | 4.10 | | | | |
|---|---|--|--|--|--|--|--|--|---|--|--|---|--|--|--|--|--|--|--|
| x/l | A | В | С | D | E | F | G | Н | I | x/l | A | В | С | D | E | F | G | Н | I |
| 0.017 .033 .067 .100 .133 .300 .367 .433 .500 .567 .633 .700 .833 .867 .900 .933 | .1056 | 3 | .1141 .0528 .0323 .0106 .0556 .0710 .0638 .0556 .0679 .0699 .0599 .0720 .0740 .0740 .0364 .0364 | .11628 .04968 .02810 .02810 .02775 .05720 .0775 .0672 .0775 .0826 .0703 .0857 .0898 .0590 .0191 .0240 | 2 1325 6 .0661 .0425 7 .0129 9 .0444 6 .0658 6 .0658 7 .0751 -0751 -0751 -0873 -0802 -0873 -0808 -0808 -0808 -0873 -0888 -0889 -0885 -0889 -0885 -0889 -0885 -0889 -0885 -0889 | 0.1982 .1388 .0711 .0414 .0168 -0416 -0683 -0672 -0631 -0744 -0826 -0713 -0898 -0980 -0683 -0344 .0137 .0496 .0793 .1244 .1183 | .1571 .0896 .0548 .0344 0260 0526 0515 0628 0720 0607 0812 | .1603 .0875 .0486 .0271 -0260 -0611 -0508 -0693 -0765 -0683 -0883 -1000 -0703 -0396 | | .567 .633 .700 .733 | . 1863 . 1138 . 0760 . 0484 - 0047 - 0425 - 0445 - 0568 - 0691 - 0660 - 0895 - 1017 - 0772 - 0466 - 0027 0341 0668 | .1826 .1080 .0834 .0313 -0137 -0434 -0485 -0444 -0638 -0720 -0658 -0904 -0996 | .162l .091' .0672 .0160 0291 0567 0598 0537 | 4 .1448 7 .0712 2 .042 2 .042 2 .042 2 .042 3 .073 6 .073 6 .075 6 .080 8 .080 8 .080 8 .080 8 .093 9 .072 1027 1027 1029 1049 | 3 .1204 2 .0508 5 .0262 058 0823 0823 0803 0700 0844 0885 0752 0905 0946 0639 0209 | .1045 .0415 .0108 .0064 .0084 .0771 .0720 .0781 .0832 .0679 .0822 .0802 .0485 .0096 | 0 .0938 5 .0333 5 .0057 5 .0127 8 .0698 8 .0844 -0741 -0680 -0741 2 .0762 -0618 8 .0711 -0403 -0045 -0045 | 3 | 6 .088 .036; .0037; .0036; .0037; .0068; .0659; .0670; .0656; .0670; .0680; .0639; .0641; .0856; .0405; .0641; .0856; .0856; |
| | | | | α = | -0.2° | | | | | | | | | α = 1 | 5.2° | | | | |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .760 .833 .867 .900 | | .1284 .0629 .0383 -0037 -0498 -0692 -0590 -0733 -0764 -0672 -0856 -0856 | .1114 .0662 .0405 0006 0468 0633 0561 0715 0746 0643 0828 | 0713 0703 0590 0754 0795 | 1340 .0662 .0384 .0117 .0438 .0664 .0571 .0736 .0766 .0653 .0890 .0592 | .1315 .0660 .0311 .0137 -0447 -0692 -0651 -0610 -0774 -0672 -0846 -0897 -0610 | .1340 .0692 .0343 .0158 -0417 -0653 -0633 -0592 -0684 -0756 -0643 -0828 -0869 -0581 | 0610 0569 0713 0774 0672 0856 0918 0600 | 0.1935 .1370 .0734 .0323 .0107 -0397 -06043 -0602 -0540 -0643 -0643 -0643 -0838 -0879 -0571 -0232 .0220 .0538 .0836 .1268 .1206 | .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 | . 2206 .1431 .1023 .0738 .0188 -0241 -0322 -0309 -0485 -0618 -0618 -0893 .1046 -0893 | 0414 0383 0608 0710 0680 0946 1069 0905 0608 | .1733 .0987 .0721 .0210 0239 0556 0627 0576 0791 0872 | 0895 0803 0977 1048 0936 1110 | .0966 .0313 .0057 0239 0791 1026 0995 0903 1026 1077 0924 1056 | .0784 .0160 0127 0311 0874 1038 0946 0885 | 0.1150 .0680 .0129 -0147 -0311 -0862 -0954 -0832 -0770 -0791 -0627 -0719 -0678 -0382 -0382 -0383 .0599 0783 .1191 .1232 | 0311 0782 0864 0710 0639 0690 0690 0577 0690 | .0660 .0210 0106 0290 0750 0842 0678 |
| | | | | α = | 2.0° | | | | | | | | | α = 8 | .40 | | | | |
| .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 | .1528 .0843 .0526 .0270 .0282 .0589 .0579 .0513 .0651 .0743 .0681 .0896 .0968 | .1601 .0896 .0620 .0170 -0280 -0536 -0536 -0485 -0658 -0709 -0628 -0842 -0904 -0669 | 0526 0711 0752 0670 0875 0916 | .1448 .0742 .0456 .0180 -0638 -0638 -0638 -0656 -0699 -0750 -0648 -0812 -0893 -0607 | .1338 .0631 .0354 .0088 .0465 .0701 .0608 .0741 .0772 .0670 .0834 .0895 .0588 .0291 .0231 .0598 .0231 | .1223 .0609 .0282 .0098 .0474 .0689 .0638 .0597 .0617 .0771 .0801 .0495 .0495 .0137 .0313 .0640 .0896 .1284 | .1143 .0528 .0221 .0047 .0547 .0731 .0629 .0721 .0629 .0722 .0782 .0485 .0313 .0641 .0837 .0887 .0887 .1256 | .0568 .0211 .0006 .0485 .0699 .0656 .0556 .0556 .0677 .0730 .0730 .0730 .0423 .0065 .0364 .0650 .0916 .0916 | .1112 .0528 .0180 .0014 .0506 .0731 .0629 .0578 .0690 .0721 .0608 .0762 | .033 .067 .100 .133 .167 .233 - .300 - .367 - .433 - .500 - .567 - .633 - .700 - .733 - .767 - .800 - .833 - .867 | . 2565 . 1739 . 1351 . 1014 . 0443 . 0037 . 0159 . 0300 . 0373 . 0537 . 0578 . 0873 . 0659 | . 2323 .1492 .1143 .0640 .0189 .0201 .0345 .0345 .0704 .0704 .0704 .0704 .0791 .1135 .0745 .0252 .0127 .0497 .0497 .1154 | .1787 .1019 .0712 .0180 .0260 .0608 .0710 .0679 .0915 .0997 .0976 .1222 .1334 .1140 | 1238 1310 1197 1361 1463 1115 | .0651 -0004 -0260 -0546 -1099 -1334 -1304 -1201 -1324 -1365 -1191 -1488 -1242 -0792 | .0374 0181 0458 0622 1176 1320 1176 1115 1125 1145 0909 0930 0817 0478 | .0364 0147 0383 0526 1068 1120 0935 0853 0843 0700 0782 0731 0434 | 0006 0294 0468 0909 0950 0776 0704 0745 0683 0683 0817 0786 0499 | 0.0845 .0446 .0027 -0250 -0424 -0853 -0690 -06628 -0649 -0669 -0526 -0669 -0526 -0608 -0321 -0066 0231 -0446 0661 .0948 |

TABLE I .- Continued

(e) M = 0.99.

| | | | α = | -2.3° | | | | | | | | | a. = 4 | .10 | | | | |
|--|---|--|--|---|--|---|--|---|--|---|--|--|---|---|--|---|--|---|
| A | В | С | D | E | F | G | Н | I | x/l | A | В | С | D | E | F | G | H | I |
| .1178 .0524 .0231 .0004 .0707 .0971 .0961 .0596 | .1211 .0574 .0339 0092 0709 0915 0944 0553 0758 | .1241 .0604 .0339 0092 0710 0925 0964 0572 0788 | 0.1808 .1338 .0662 .0378 .0084 0631 0905 1003 0582 0788 | 0.1936 .1437 .0731 .0447 .0143 0572 0876 1004 0572 0808 | .1563 .0878 .0515 .0300 0445 0778 0895 0543 0719 | .1672 .0976 .0604 .0378 0367 0729 0857 0514 0710 | .1789 .1064 .0633 .0398 0239 0660 0827 0415 0650 | .1789 .1064 .0653 .0388 0249 0661 0896 0416 | .033 .067 .100 .133 .167 .233 .300 .367 .433 | .1989 .1208 .0846 .0553 0111 0571 0688 0319 0571 | .1993 .1210 .0887 .0388 0190 0552 0728 0376 | .1826 .1063 .0750 .0250 0317 0669 0816 0464 0738 | 0.2159 .1621 .0838 .0525 .0221 0493 0836 1002 0572 0826 | .1386 .0642 .0358 .0055 0659 0953 1070 0640 0875 | .1180 .0515 .0202 0004 0767 1012 1051 0689 0855 | 0.1552 .1102 .0446 .0143 0816 1012 1022 0659 0796 | 0.1542 .1063; .0495 .0123 0102 0787 0983 1002 0620 0767 | .1053 .0485 .0133 0102 0777 0963 0982 0591 0738 |
| .0727 .0746 .0991 .0961 .0473 .0035 .0436 .0739 .0983 .1335 | 0719 0935 | 0768 0994 0533 0043 .0427 .0721 .1005 .1348 | 0817 0993 1052 0562 0063 .0388 .0701 .0995 .1358 | 0876 1043 1141 0670 | 0739 0866 1042 1130 0699 0200 .0310 .0672 .0976 .1407 .1328 | 0886 1062 1170 0768 | 0905 1062 1189 0778 | 0651 0915 1072 1219 0788 0308 .0202 .0535 .0878 .1388 .1348 | .567 .633 .700 .733 .767 .800 .833 .867 | 0962 1098 1303 0991 0326 | 0963 1051 1286 1032 0376 .0114 .0476 .0818 .1347 | 0992 1100 1286 0953 0346 .0153 .0524 .0877 .1376 | 1051 1100 1335 0885 0258 .0211 .0583 .0936 .1347 | 1002 1090 1237 0699 0141 .0329 .0681 | 0943 1022 1129 0581 0043 .0427 .0740 .0975 .1327 | 0816 0924 0982 0464 .0025 .0466 .0759 .0975 | 0806 0914 0973 0425 .0045 .0476 .0720 .0965 .1288 .1268 | 0748 0885 0914 |
| | | | α = | -0.20 | | | | | | | | | α = | 6.2° | | | | |
| 0729 0729 0817 1082 1082 0611 0102 0329 .0652 .0956 1358 | .1447 .0761 .0486 .0045 0553 0827 0759 0720 0788 1014 1033 0602 .0388 .0682 .0388 .0682 | .1448 .0751 .0487 .0035 0553 0553 0759 0740 0789 1054 1054 0663 .0339 .0663 .0967 | .1476 .0761 .0476 .0182 0524 0837 0533 0759 0739 0739 1004 1073 0622 0131 .0388 .0665 | .1487 .0771 .0467 .0182 0524 0553 0769 0759 0759 1024 1093 1093 0151 0.310 | .1496 .0829 .0476 .0251 .0494 .0906 .0543 .0720 .0720 .0808 .1014 .1073 .0622 .0151 .0349 .0692 | .1487 .0820 .0457 .0241 -0494 -0563 -07563 -0740 -07799 -1034 -1093 -0632 -0180 -0320 -0320 -0320 -0320 -0320 -0320 -0320 | .1555 .0888 .0486 .0222 .0416 0778 0720 0700 0837 1053 .1112 0602 0171 .0339 .0653 .0957 .1388 | .1536 .0869 .0467 .0212 .0436 .0799 .0936 .0524 .0740 .0720 .0838 .1063 .1132 .0612 .0190 .0320 .0634 .0948 .1369 | .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .561 .633 .700 .733 .761 .800 .833 .867 | .2323 .1502 .1091 .0798 .0153 0512 0241 0493 1080 1314 1070 0454 0023 .0358 .0673 .1297 | .2251 .1427 .1084 .0565 .0006 .0416 .0612 .0631 .0631 .0975 .1308 .1355 .1355 .1308 .0494 .0333 .0677 | .1945 .1161 .0838 .0319 0229 0601 0788 0748 0748 1071 1199 1365 1071 0484 016 0404 0404 | .1555 .0741 .0437 .0124 0573 1122 0729 1023 1024 1094 | 1210 .0456 .0172 0121 0826 1110 1238 0836 1061 1042 1140 1267 1306 0738 0161 .0329 .0672 .0946 .1328 .1338 | .0918 .0251 -0063 -0249 -1004 -1210 -1229 -0848 -1033 -1053 -1131 -1131 -0563 -0033 -0033 -0038 -0092 | .0828 .0231 .0053 .0229 .0993 .1130 .1101 .0768 .0866 .0836 .0758 .0934 .0885 .0425 .0025 .0025 .0025 | . 0810 . 0280 . 0269 - 0955 - 1073 - 1043 - 0690 - 0808 - 0759 - 07455 - 04455 - 04455 - 04455 - 0445 - 0604 0604 | .0848 .0319 0014 0210 0895 1013 0973 0611 0729 0680 0856 0817 0307 .0065 .0476 .0691 .0871 |
| | | | α | 2.00 | | | | | | | | | α = | 8.40 | | | | 1 |
| . 0934 . 0602 . 0338 - 0346 - 0747 - 0825 - 0476 - 0668 - 0971 - 1261 - 0805 - 0215 . 0215 . 0257 . 0895 . 1395 | .1722 .0976 .0682 .0222 .0700 .0700 .0700 .0755 .0825 .0945 .0847 .0749 | 2 | 1594 0825 0826 0826 0826 0826 0826 0826 0826 0826 0826 0826 0826 0826 0836 0956 0957 | 14939 .07565 .07565 .04565 .04565 .04565 .05555 .05733 .05333 .0777 .0747 | . 1369 . 0712 . 0369 2 . 0369 2 . 0588 3 . 0955 2 . 0602 7 . 0759 4 . 0775 8 . 1024 9 . 0573 1 . 0702 1 . 0102 0 . 0388 1 . 0722 1 . 0102 0 . 0388 1 . 0722 1 . 0102 0 . 0388 | 1297 00644 0319 | 7 .13002 .0688 .0290 .0055 .0056 .0056 .0056 .0057 .00 | 1278 2 .0661 .0290 .0290 .0045 2 .0630 .0945 5 .0963 8 .0542 9 .0738 9 .0699 9 .0855 4 .0943 5 .1080 .0993 .0456 .0740 .0740 .0740 .0740 .0943 .0944 | .033 .067 .100 .133 .166 .233 .300 .366 .433 .700 .566 .633 .703 .766 .800 .833 .866 .900 | 3 .27323 7 .1855 7 .1444 1.1443 1.0483 3 .0483 3 .0925 1 .0323 1 .0323 | 2 .2599 1711: 1356: 0816: | 207(124) 9 .207(124) 9 .089(124) 0.089(124) 0.089(124) 0.089(124) 0.074(| 0644 0644 0333 0014 0644 0333 0016 1 - 0666 1 - 1066 1 - 1066 1 - 1156 1 - 1157 1 - 123 1 - 167 1 - 123 0 - 000 0 - 017 0 - 001 1 - 125 0 - 000 0 - 1156 0 | 38 | 0634 0634 0724 0724 0724 0724 0724 0724 0724 0724 0724 0724 0724 0724 0724 0724 0724 0724 0724 0744 | 2 .0554 7 -0266 3 -0427 7 -1166 3 -124 3 -1155 5 -085 5 -087 9 -093 1 -087 1 -087 1 -092 1 -092 1 -092 1 -093 1 -092 1 -0 | | 2 .0661 3 .0173 5 .0370 2 .0973 2 .0973 3 .0593 5 .0695 6 .0599 2 .0933 3 .0799 6 .0796 6 .0599 6 .0599 7 .0599 7 .129 |
| | 1657 1178 0524 0727 0746 0707 0707 0707 0707 0707 0707 070 | 1.657 0.1612 1178 1.211 1.052 1.251 0.0524 0.0524 0.0004 - 0.0094 0.0004 - 0.0707 - 0.0709 0.0717 - 0.073 0.0737 0.0737 0.0737 0.0737 0.0737 0.0737 0.0737 0.0737 0.0739 0.0035 0.0436 0.0524 0.0524 0.0526 0.0524 0.0526 0 | 1.657 0.1612 0.1662 1178 1.211 0.0524 0.0524 0.0524 0.0524 0.0524 0.0524 0.0524 0.0524 0.0524 0.0525 | A B C D 1657 0.1612 0.1662 0.1808 1178 .1211 .1241 .1338 0524 .0574 .0604 .0662 0231 .0339 .0339 .0378 0004 .0092 .0094 .0092 .0084 0707 .0709 .0701 .0631 071 .0915 .0925 .0995 .0905 0961 .0944 .0964 .1003 0727 .0705 .0768 .0817 0791 .0915 .0925 .0958 .0772 .0582 0737 .0758 .0768 .0788 .0788 0727 .0709 .0768 .0817 0991 .0935 .0994 .0993 .0993 0991 .0935 .0994 .0993 .0993 0006 .0025 .0096 .0994 .0993 .0063 0353 .0066 .0043 .0063 .0063 0457 .0427 .0388 .0383 .0562 .0383 .0562 .0953 .0563 .1325 .1319 .1280 .1299 1887 0.1878 0.1880 0.1976 .0163 .0064 .0063 .0063 .0064 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0062 .0063 | 1.657 0.1612 0.1662 0.1808 0.1936 1178 1211 1.241 1.338 1.437 1.924 1.0324 1.0339 0.339 0.3378 0.0447 0.004 -0.0022 -0.092 0.084 0.114 0.092 -0.092 0.084 0.114 0.092 -0.092 0.084 0.114 0.0961 -0.944 -0.0961 -0.944 -0.0961 -0.944 -0.0961 -0.944 -0.0961 -0.944 -0.0961 -0.944 -0.0961 -0.944 -0.0961 -0.944 -0.0961 -0.0759 -0.0768 -0.0788 0.0788 0.0788 -0.0788 -0.0788 -0.0788 -0.0788 -0.0788 -0.0788 -0.0788 -0.0788 -0.0788 -0.0788 -0.0786 -0.0789 -0.0766 -0.0787 -0.0766 -0.0787 -0.0766 -0.0787 -0.0766 -0.0787 -0.0766 -0.077 -0.0768 -0.0788 -0.0729 -0.0925 -0.0994 -0.0925 -0.0994 -0.0925 -0.0948 -0.0925 -0.0948 -0.0925 -0.0948 -0.0925 -0.0948 -0.0925 -0.0948 -0.0925 -0.0948 -0.0325 -0.006 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.063 -0.043 -0.062 -0.093 -0.093 -0.093 -0.093 -0.025 -0.094 -0.025 -0. | A B C D E F 1657 0.1612 0.1662 0.1808 0.1936 0.2112 1178 1.211 1.241 1.338 1.437 1.1563 0524 0.0574 0.664 0.662 0.731 0.878 00231 0.0339 0.0339 0.378 0.044 0.052 000400920092 0.0084 0.0143 0.300 0707 0.709907100631 0.072 0.045 0.0961 0.944 0.9964 0.1003 -1004 0.0895 0.0961 0.0944 0.0968 0.088 0.088 0.0739 0.727 0.7099 0.749 0.0768 0.088 0.0739 0.727 0.7099 0.749 0.0768 0.0876 0.0876 0.0991 0.9935 0.9994 0.0993 0.1043 0.1042 0.0991 0.9935 0.0994 0.0993 0.1043 0.1042 0.0991 0.0935 0.0066 0.0064 0.0068 0.0749 0.091 0.0935 0.0066 0.0064 0.0068 0.0141 0.0200 0.0961 0.0925 0.0994 0.0993 0.1043 0.1042 0.0473 0.0484 0.533 0.0663 0.0141 0.0200 0.035 0.0066 0.0043 0.063 0.0141 0.0200 0.035 0.0066 0.0043 0.063 0.0141 0.0200 0.035 0.0065 0.0061 0.0069 0.0014 0.0200 0.035 0.0065 0.0061 0.0069 0.0061 0.0931 0.055 0.0065 0.0066 0.072 0.0931 0.055 0.0065 0.0995 0.0966 0.0976 0.0931 0.1878 0.1880 0.1976 0.1978 0.2035 1.1325 1.1319 1.280 1.299 1.299 1.328 2 a = -0.20 2 | A B C D E F G 1657 0.1612 0.1662 0.1808 0.1936 0.2112 0.2240 1178 1.211 1.241 1.338 1.437 1.1563 1.672 0524 0.0574 0.604 0.662 0.731 0.878 0.976 00231 0.339 0.339 0.378 0.447 0.515 0.604 0004 0.092 0.092 0.0084 0.143 0.300 0.378 00707 0.709 0.710 0.6631 0.072 0.445 0.350 00061 0.944 0.9964 0.1003 0.1004 0.895 0.857 0.956 0.0553 0.0572 0.0582 0.072 0.045 0.073 0.0727 0.709 0.709 0.708 0.88 0.808 0.719 0.072 0.0737 0.0758 0.0768 0.0788 0.088 0.0739 0.0719 0.0727 0.0799 0.7049 0.0768 0.0876 0.0778 0.0739 0.0727 0.0799 0.0768 0.0876 0.0866 0.0866 0.0991 0.9935 0.9994 0.1052 0.1141 0.1052 0.0961 0.0925 0.0994 0.1052 0.1141 0.1052 0.0473 0.0484 0.0533 0.063 0.0141 0.0200 0.0278 0.035 0.0066 0.0043 0.0063 0.0141 0.0200 0.0278 0.035 0.0066 0.0043 0.0063 0.0141 0.0200 0.0278 0.035 0.0066 0.0043 0.0063 0.0141 0.0200 0.0278 0.035 0.0065 0.0072 0.099 0.0728 0.035 0.0065 0.0067 0.0699 0.0768 0.035 0.0065 0.0067 0.0699 0.0768 0.035 0.0065 0.0067 0.0067 0.0067 0.035 1.335 1.336 1.348 1.358 1.358 1.407 1.397 1.335 1.335 1.336 1.348 1.358 1.358 1.407 1.397 1.335 1.335 1.336 0.1880 0.1976 0.4978 0.2035 0.2027 1.337 0.487 0.487 0.497 0.0476 0.467 0.476 0.957 0.0368 0.0486 0.0487 0.0476 0.0467 0.0476 0.0476 0.0368 0.0486 0.0487 0.0476 0.0467 0.0476 0.0476 0.0368 0.0068 0.0068 0.0069 0.0068 0.0069 0.0068 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0067 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.0068 0.0069 0.006 | A B C D E F G H 1.657 0.1612 0.1662 0.1808 0.1936 0.2112 0.2240 0.2367 1178 .1211 .1241 .1338 .1437 .1563 .1672 .1769 0.924 .0574 .0604 .0662 .0731 .0878 .0976 .1064 0.9231 .0339 .0339 .0339 .0339 .0378 .0447 .0515 .0604 .0632 0.0004 .0092 .0092 .0084 .0143 .0300 .0378 .0338 0.0004 .0092 .0092 .0084 .0143 .0300 .0378 .0338 0.0707 .0709 .0710 .0631 .0572 .0445 .0367 .0239 0.0961 .0944 .0964 .1003 .1004 .0895 .0857 .0827 .0857 0.0737 .0738 .0788 .0788 .0788 .0380 .0719 .0710 .0650 0.0727 .0709 .0749 .0768 .0788 .0789 .0719 .0710 .0650 0.0727 .0709 .0768 .0817 .0876 .0866 .0886 .0905 0.0746 .0719 .0768 .0817 .0876 .0866 .0886 .0905 0.0911 .0935 .0994 .0993 .1043 .1042 .1062 .1062 0.0951 .0954 .0993 .0943 .0043 .1042 .1062 .1062 0.0961 .0925 .0994 .0993 .1043 .1042 .1062 .1062 0.0473 .0464 .0533 .0563 .0141 .0200 .0278 .0288 0.0476 .0427 .0388 .0329 .0310 .0241 .0221 0.0739 .0750 .0721 .0701 .0662 .0672 .0613 .0643 0.0477 .0427 .0788 .1358 .1358 .1407 .1397 .1407 0.1878 .1388 .1388 .1358 .1358 .1407 .1397 .1407 0.1877 .0468 .0487 .0467 .0476 .0477 .0467 0.0751 .0751 .0761 .0771 .0829 .0820 .0828 .0888 0.0123 .0045 .0035 .0084 .00921 .0241 .0222 0.0852 .0867 .0936 .0955 .0966 .0976 .0917 .0947 0.0877 .0966 .0916 .0955 .0966 .0976 .0917 .0947 0.0975 .0769 .0759 .0769 .0769 .0769 .0769 .0769 .0769 0.0729 .0720 .0710 .0622 .0642 .0684 .0808 .0318 .0778 0.0975 .0987 .0998 .0999 .0888 .0931 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 .0940 | A B C D E F G H I 1.657 0.1612 0.1662 0.1808 0.1936 0.2112 0.2240 0.2367 0.2387 1178 1211 1.241 1.338 1.1437 1.555 1.672 1.789 1.789 0.784 0.0504 0.062 0.0731 0.878 0.0974 0.0604 0.062 0.0731 0.878 0.0976 1.064 1.064 1.064 0.0331 0.339 0.339 0.338 0.0447 0.0515 0.0604 0.0633 0.0533 0.0004 0.0092 0.0094 0.0092 0.0084 0.0143 0.0030 0.378 0.038 0.388 0.388 0.0707 0.0709 0.0710 0.0510 0.0876 0.0641 0.054 0.0096 0.0573 0.0572 0.0876 0.0772 0.045 0.0573 0.0596 0.0596 0.0573 0.0772 0.0876 0.0772 0.045 0.0573 0.0572 0.0971 0.0971 0.0971 0.0971 0.0971 0.0971 0.0971 0.0972 0.0788 0.0788 0.0788 0.0789 0.0793 0.0710 0.0550 0.0680 0.0737 0.0779 0.0769 0.0788 0.0868 0.0799 0.0710 0.0550 0.0680 0.0737 0.0795 0.0789 0.0789 0.0788 0.0868 0.0799 0.0710 0.0550 0.0680 0.0737 0.0795 0.0994 0.0993 1.043 1.1042 1.1062 1.1062 1.1062 0.0961 0.0955 0.0994 0.0993 1.003 1.1043 1.1042 1.1062 1.1062 1.1072 0.0961 0.0955 0.0994 0.0933 0.063 0.0141 1.0200 0.0278 0.0288 0.0388 0.0380 0.0350 0.0055 0.0060 0.0043 0.063 0.0141 1.0200 0.0278 0.0278 0.0888 0.0308 0.0350 0.0950 0.0721 0.0975 0.0975 0.0975 0.0975 0.0975 0.0975 0.0975 0.0975 0.0975 0.0975 0.0975 0.0975 0.0975 0.0066 0.0976 0.0977 0.0971 0.0971 0.0977 0. | A B C D E F G H I X/1 1657 0.1612 0.1662 0.1808 0.1936 0.2112 0.2240 0.2367 0.2387 0.017 1178 1.211 1.1241 1.1338 1.437 1.563 1.672 1.1789 1.1789 0.033 0.0924 0.574 0.604 0.662 0.0731 0.878 0.976 1.064 1.064 1.064 0.067 0.0231 0.339 0.339 0.378 0.447 0.515 0.604 0.633 0.653 1.00 0.0014 0.0092 0.0092 0.0084 0.0143 0.300 0.378 0.398 0.398 1.330 1.000 0.00707 0.0709 0.0710 0.0631 0.0722 0.0445 0.306 0.378 0.398 3.98 1.300 0.0707 0.0709 0.0710 0.0631 0.0722 0.0445 0.076 0.076 0.066 0.661 2.33 0.000 0.0707 0.0709 0.0710 0.0651 0.0722 0.0445 0.056 0.066 0.0661 2.33 0.0571 0.0944 0.0964 0.1003 0.1004 0.0895 0.0877 0.0827 0.0896 0.066 0.0964 0.0710 0.072 0.0799 0.0789 0.0788 0.0808 0.0739 0.0701 0.0650 0.0660 0.033 0.0727 0.0799 0.0749 0.0768 0.0788 0.0808 0.0739 0.0701 0.0650 0.0680 0.433 0.0727 0.0799 0.0749 0.0768 0.0788 0.0808 0.0739 0.0719 0.0650 0.0651 0.0060 0.00727 0.0709 0.0749 0.0768 0.0788 0.0876 0.0795 0.0991 0.0093 0.0994 0.0993 0.1043 0.1042 0.1062 0.1062 0.1072 0.0550 0.0651 0.0060 0.00737 0.0949 0.0768 0.0373 0.0061 0.0925 0.0994 0.1052 0.1141 0.130 0.1170 0.1189 0.1299 0.0035 0.0066 0.0043 0.0053 0.0066 0.0043 0.0053 0.0066 0.0043 0.0053 0.0066 0.0043 0.0053 0.0066 0.0068 0.0088 0.0095 0.0915 0.0060 0.0073 0.0060 0.0073 0.0060 0.0073 0.0060 0.0073 0.0060 0.0073 0.0060 0.0073 0.0060 0.0073 0.0060 0.0073 0.0072 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 0.0072 0.0070 | A B C D E F F G H I x/1 A 1657 0.1612 0.1662 0.1808 0.1936 0.2112 0.2240 0.2367 0.2387 0.017 0.2576 1178 1.211 1.1241 1.1336 1.1437 1.1563 1.1672 1.169 1.1769 0.33 1.1998 0.231 0.339 0.339 0.3376 0.0447 0.915 0.6608 0.633 0.6926 1.004 0.066 0.0631 0.033 0.0939 0.038 0.039 0.038 0.039 0.038 0.039 0.038 0.039 0.038 0.039 0.038 0.039 0.038 0.039 0.038 0.039 0.038 0.039 | A B C D E F G H I X/1 A B 1657 0.1612 0.1666 0.1868 0.1936 0.2112 0.2200 0.2367 0.2387 0.2387 0.017 0.2776 0.2511 1178 1.2211 1.1241 1.0321 1.1371 1.953 1.1673 1. | A B C D E F G H I x/1 A B C | A B C D E F G H I X/1 A B C D L E F G H I X/1 A B C D | A B C D E F G H I I X/1 A B C D E F G H I I X/2 A B C D E E E F G H I I X/2 A B C D D E E E F G H I I X/2 A B C D D E E E F G H I I X/2 A B D C D D E E E F G H I I X/2 A B D C D D E E E F G H I I X/2 A B D C D D E E E X/2 A B D C D D E E E X/2 A B D C D D E E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E E X/2 A B D C D D E X/2 A B D D E X/2 A B D D E X/2 A B | A B C D E F O B T | A B C D E F G H I X/1 A B C D E F G | A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G H I x/1 A B C D E F G I X/1 A B C D E F G H X/1 X/1 |

TABLE I .- Continued

(f) M = 1.0.

| | | | | α = - | -2.3° | | | | | | | | | a = 1 | +.1° | | Life in | | |
|---|--|---|--|---|--|---|---|--|--|---|--|---|---|---|--|--|---|--|---|
| x/l | A | В | С | D | Е | F | G | Н | I | x/l | A | В | С | D | E | F | g. | Н | I |
| 0.017 .033 .067 .100 .133 .300 .367 .233 .300 .500 .567 .433 .700 .733 .707 .800 .833 .900 .933 | 0.1725 .1256 .0593 .0125 .0057 .0704 .0909 .0968 .0622 .0694 .0763 .0821 .0987 .1046 .0773 .0105 .0544 .0827 .1061 .1403 .1383 | 0.1696 .1286 .0623 .0379 -0041 -0802 -0968 -0656 -0792 -1105 -0909 .0047 .0593 .0857 .1101 .1432 .1384 | 0.1688 .1278 .0594 .0350 .0842 .0842 .1008 .0784 .0784 .0862 .1057 .0991 .0018 .0506 .0780 .1034 .1376 | 0.1901 .1432 .0662 .0398 .0154 -0656 -0812 -1046 -0714 -0831 -0919 -1066 -0002 .0544 .0827 .0847 .1081 .1442 | 0832 10578 0578 0784 0969 0998 1135 1223 1077 0061 .0408 .0721 .1014 | 0.2223 .1676 .0886 .0544 .0379 -0655 -0626 -0665 -0724 -0968 -1261 -1251 -0119 .0466 .0769 .062 .1481 .1393 | 0.2313 .1747 .0936 .05948 .0617 .0686 .0940 .0520 .0863 .0998 .1104 .1194 .1292 .0139 .0653 .0965 .1366 | 0.2457 .1823 .1110 .0418 -0256 -0578 -1007 -0616 -0617 -0968 -1066 -1310 -1329 -0226 .0398 .0652 .0938 .1472 .1423 | 0266 0608 098 0451 0666 0725 1008 1086 1233 0158 .0291 .0565 .0916 .1415 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .767 .800 .833 .867 .900 | 0.2667 .2067 .1273 .0886 .0625 -0081 -0507 -0710 -0416 -0459 -0633 -0933 -11262 -1399 -0178 .0257 .0567 .0866 .1438 .1515 | 0.2567 .2050 .1268 .0957 .0447 .0295 .0559 .0559 .0691 .1165 .1262 .1399 .0227 .0281 .0594 .0594 .0594 | 0.2401 .1907 .1131 .0316 .0285 .0285 .0515 .0828 .0615 .0780 .1129 .1245 .1366 .0636 .0636 .0985 .1451 .1441 | 0.2206 .1669 .0907 .0574 .0262 .0500 .0774 .1038 .0617 .0735 .0959 .1077 .1204 .1350 .0619 .0360 .0692 .1024 .1424 .1297 | 0.2013 .1470 .0714 .0423 .0132 .0605 0877 1090 .0663 0770 0848 1003 1119 1119 1145 1119 .0004 .0471 .0782 .1063 .1422 .1354 | 0998 | 0.1645 .1179 .0529 .0209 .0025 -0751 -0906 -1032 -0668 -0858 -0954 -1042 -0770 .0112 .0568 .0859 .1393 .1393 | 0.1610 .1102 .0535 .0164 0051 0764 0862 .1086 0637 0705 0725 0852 0940 0115 .0594 .0803 .0115 .0594 .0803 .0115 .0594 .0803 .0115 .0594 .0803 .0115 | 084 099 057 064 069 077 090 065 .014 .061 |
| | 1 | | | α = | -0.2° | | | | - | | | | | α = | 6.2° | | | | |
| 0.017 .033 .067 .100 .133 .300 .367 .433 .500 .567 .633 .700 .733 .700 .833 .867 .900 | .1372 .0680 .0212 .0144 0596 0859 0918 0655 0752 0859 1035 | 0.1943 .1503 .0799 .0536 .0086 -0676 0745 0959 0676 0852 1077 1175 1077 1175 1073 .0516 .0793 .1454 .1386 | .1472 .0769 .0569 .0096 .0675 .0744 .0900 .0451 .0685 .0852 .1027 .1066 .0997 .0018 .0506 .0808 .1130 .1462 | .1552 .0760 .0506 .0242 0569 0735 0999 0676 0833 0921 1057 1233 1145 0041 .0477 .0790 | .1579 .0789 .0525 .0262 .0549 .0724 .0968 .0480 .0685 .0851 .0900 .1037 .1144 .1007 .0467 .0769 .0769 | 0.2138 .1601 .0839 .0506 .0330 0706 0960 0960 0988 0657 0720 1028 1136 0070 .0487 .0790 .1063 .1474 .1396 | .1677 .0886 .0564 .0388 0646 0956 0900 0920 1007 1105 0921 .0467 .0759 .1052 .1482 | .1611 .0946 .0526 .0281 0422 0667 1038 | .1735 .1052 .0632 .0379 -0314 -0595 -0431 -0686 -0685 -0919 -1007 -1134 -1085 -0021 .0457 .0711 | 0.017 .033 .067 .100 .137 .233 .300 .367 .433 .500 .767 .633 .767 .800 .833 .867 .900 | 0251 0410 0526 0894 1126 1339 1494 0575 .0190 .0480 .0780 | 0.2897 .2331 .1492 .0633 0656 0431 0510 0558 0910 1203 1203 1203 1203 1203 1354 0519 0789 0789 0789 | 0.2556 .2013 .1218 .0879 .0374 0208 0586 0692 0741 1051 1255 1429 0411 .0200 .0879 .1431 .1538 | .0769 .0496 .0164 0568 0881 1183 0871 1251 1398 1637 0236 .0301 .0652 .1004 | .1276 .0510 .0219 -0072 -0789 -1071 -1303 -0906 -0974 -1012 -1187 -1323 -1449 -123 -0023 .0471 .0762 .1024 | .0984 .0301 .0008 0148 1164 1125 1300 0939 0900 | .0297 0014 0178 0954 1061 1158 0857 0780 0818 0857 0731 0731 074 0529 | 0.1335 .0857 .0350 .0002 .0187 .0900 .0949 .1115 .0715 .0715 .0841 .0696 .0666 .0566 .0525 .0711 .0935 .1306 .1462 | .090 .039 .003 015 085 091 101 |
| | | | | α = | 2.0° | | | | | | | | | α = | 8.4° | | | | |
| 0.017 .0333.067 .1000 .1333.300 .367 .433.500 .367 .433.700 .7333.767 .800 .833.867 | .0432 -0294 -0633 -0817 -0575 -0672 -0914 -1106 -1205 -1176 -0062 0364 -0994 1478 | .1777 .1034 .0751 .0272 0491 0627 0633 .0422 0627 0686 0872 1155 1233 0100 .0389 .0692 .1005 .1005 | 1743 1015 0705 0239 -0392 -0635 -0635 -0635 -0635 -0653 -052 -052 -1052 -1052 0413 0714 0413 -1035 | .1650 .0907 .0604 .0281 0500 0715 0970 0500 0686 0842 1197 1197 1197 1197 1197 1197 1191 0731 .0418 | . 1568 .0831 .0520 .0248 0518 0741 0965 0538 0693 0732 1013 1013 1081 .0068 .0462 .0782 .1054 .1054 | .1484 .0731 .0418 .0242 -0794 -0764 -0979 -0539 -0686 -0784 -0911 -1097 -0989 .0018 .0516 .0516 | .1384 .0734 .0190 .0190 .0606 .0771 .0965 .0557 .0674 .0732 .0829 .0955 .0181 .0955 .0540 .0550 .0540 | .1347 .0721 .0340 .0115 0608 0764 1061 0735 0876 0775 0876 .0066 .0565 .0819 .1083 | 1316 .0685 .0316 .0074 .0015 .0079 .0015 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .700 .733 .767 .800 .833 .867 | .2783 .1883 .1467 .1167 .0499 .0081 0275 .0410 .0807 1543 1543 1078 .0161 .0441 .0441 | .2660 .1763 .1412 .0866 .0183 0177 0489 0392 0538 0860 1152 3309 1562 0821 .0437 .0437 | 0130 0547 0866 0672 0750 0818 1157 1360 1583 1797 0789 .0093 .0432 | .1500 .0632 .0359 .0004 .0684 .1026 .1055 .1318 .1465 .1572 .1572 .0304 .0213 .0632 .1041 | .1014 .0238 .0052 0343 1041 1383 1196 1235 1254 1348 1545 1622 0043 .0471 .0771 .0771 | 1191 1484 1055 1065 1172 1162 1104 0723 .0086 .0534 .0817 .1061 | .0616 .0045 .0045 .0246 .0391 .1157 .1254 .0915 .0857 .0905 .0905 .1021 .0035 .0490 .0762 .0994 | .0661 .0174 -0129 -0304 -0996 -0996 -0675 -0723 -0792 -1016 -1133 -0655 -0070 .0369 .0564 .0866 .1422 | .072 .023 008 091 091 063 060 065 073 085 001 04 065 060 060 0 |

NACA

TABLE I .- Continued

(g) M = 1.01.

| | | | | α = | -2.3° | | | | | | | | | a = 1 | +.1° | | | | |
|---|---|--|---|--|--|---|--|---|--|--|---|--|---|---|---|---|--|---|--|
| x/l | A | В | c · | D | E | F | G | н | I | x/l | A | В | c . | D | E | F | G | н | I |
| 0.017 .033 .067 .100 .133 .300 .367 .433 .500 .567 .633 .700 .733 .767 .800 .833 .867 .900 | .0152 0580 0753 | 0.1721 .1293 .0631 .0387 -0021 -0683 -0820 -0742 -0859 -0793 -0732 -0937 -1160 -0372 .0582 .0913 .1166 .1458 .1400 | 0.1793 .1407 .0732 .0490 .0056 -0581 -0735 -0928 -0658 -0784 -0620 -0677 -0909 -1121 -0330 .0645 .0963 .1224 .1533 .1446 | .1419 .0718 .0446 .0154 -0606 -0820 -1073 -0771 -0907 -0742 -0800 -0995 -1267 -1287 | 0.2102 .1610 .0886 .0606 .0297 -0446 -0658 -0813 -0658 -0735 -0957 -1237 -1237 -0581 .0596 .0925 .1194 .1542 .1407 | 0.2296 .1653 .0933 .0602 .0349 -0411 -0703 -0956 -0722 -0839 -1044 -1306 -11443 -0907 .0485 .0845 .1108 | 0.2430 .1851 .1118 .0770 .0539 -0234 -0552 -0813 -0600 -0706 -0600 -0697 -0967 -1218 -1392 -0890 .0539 .0886 .1146 .1581 .1504 | 0.2510 .1867 .1166 .0680 .0465 -0771 -0586 -0761 -0625 -0771 -1034 -1287 -1482 -1073 .0436 0757 .1059 .1517 .1439 | 0.2575 .1967 .1924 .0770 .0539 .0098 .0484 .0735 .0504 .0677 .0552 .0697 .1218 .1411 .1006 .0529 .0828 .1118 .1571 .1504 | .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 | 0.2661 .2073 .1291 .0866 .0625 0069 0504 0754 0548 0755 1044 1276 1546 .0342 .0762 .0762 .0982 .1484 .1542 | 0.2638 .2094 .1299 .1007 .0493 .0118 .0749 .0526 .0720 .1021 .1254 .1555 .1399 .0415 .0755 .1066 .1531 .1541 | 0.2346 .1873 .1109 .0810 .0307 -0302 -0630 -0901 -0659 -0862 -0717 -0814 -1104 -1297 -1567 -1394 .0385 .0771 .1080 .1506 | 0.2327 .1726 .0930 .0609 .0309 -0429 -0740 -1021 -0740 -0895 -1740 -1362 -1469 -1332 -1432 -0483 .0852 .1143 .1502 .1454 | 0.1969 .1448 .0713 .0385 .0133 .0620 .0891 .1142 .0814 .0997 .0823 .1065 .1297 .0814 .0501 .0887 .1138 .1457 .1322 | .1279 .0639 .0289 .0105 .0662 .0875 .1050 .0897 .0740 .0740 .0953 .1167 .1186 | | 0.1716 .1182 .0629 .0221 .0037 -0662 -0817 -0798 -0623 -0613 -0633 -0619 .0293 .0619 .0949 .1163 .1454 .1434 | 0.1651 .1148 .0597 .0191 .0002 .0688 .0852 .0978 .0746 .0852 .0659 .0620 .0852 .1065 .1046 .0369 .0588 .1428 .1457 |
| | | | | α, = | -0.2° | | | | | | | | | α, = 6 | 5.2° | | | | |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .706 .733 .767 .800 .833 .867 .900 | 0.2006 1514 0.799 0.481 0.249 0.0475 0.726 0.0919 0.0471 0.639 0.0726 0.0958 1.208 0.0610 0.0539 0.0905 1.156 1.1523 1.1446 | 0.2059 .1592 .0873 .0581 .0154 -0488 -0643 -0896 -0643 -0702 -0955 -1168 -1304 -0663 .0552 .0912 .1184 .1534 .1456 | 0.1989 .1583 .0878 .0578 .0162 0485 0691 0601 0717 0959 1181 0640 .0549 .0907 .1177 .1525 .1448 | 0653 0809 0663 0721 0925 1207 1285 | .1622 .0907 .0559 .0307 0447 0698 0949 | 0.2243 .1612 .0912 .0513 .0348 0410 0653 0770 0653 0702 0935 1188 1314 0663 .0552 .0931 .1164 .1553 .1456 | 0.2182 .1661 .0945 .0568 .0365 -0408 -0669 -0785 -0640 -0698 -0949 -1200 -1326 -0698 .0598 .0598 .1545 .1545 .1448 | 0.2263 .1660 .0999 .0523 .0319 -0371 -0624 -0818 -0605 -0741 -0702 -0964 -1188 -1334 -0770 .0552 .0892 .1164 .1553 .1456 | 0.2240 .1670 .0994 .0578 .0327 -0350 -0640 -0833 -0621 -0775 -0630 -0775 -0968 -1200 -1326 -0777 .0549 .0877 .1158 .1535 .1448 | .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 | 0.3122 .2498 .1671 .1219 .0969 .0267 -0552 -0540 -0429 -0521 -0646 -0963 -1223 .1492 -1675 .0354 .0681 .0940 .1498 .1786 | 0.2923 .2349 .1504 .1193 .0649 .0066 -0361 -0682 -0643 -0760 -1061 -1304 -1731 .0299 .0649 .0643 -1731 .0299 .0649 | 0.2532 2031 1241 .0913 .0403 -0175 -0570 -0869 -0667 -0840 -1168 -1370 -1168 -1592 .0364 .0721 1067 .1549 .1607 | .1621 .0834 .0494 .0192 0527 0896 1207 0915 1080 0944 | 0.1771 .1279 .0566 .0239 -0021 -0744 -1033 -1293 -0965 -1139 -0936 -1168 -1360 -1360 -0705 .0566 .0904 .1145 .1501 .1443 | .1057 .0377 .0027 -0138 -0886 -1110 -1275 -0993 -0886 -0915 -0847 -1032 -1207 | 0.1434 .0981 .0374 .0066 .0089 .0859 .0994 .1110 .0830 .0898 .0705 .0647 .0840 .1052 .1013 .0329 .0557 .0923 .1106 .1472 .1530 | 0.1426 .0931 .0416 .0027 .0128 0818 0925 1022 0770 0847 0663 0634 0847 1071 1003 0342 .0503 .0824 1038 1378 .1562 | 0.1434 .0990 .0451 .0094 -0763 -0869 -0782 -0570 -0551 -0763 -0956 -0898 -0224 .0624 .0913 .1096 .1424 .1674 |
| | | | | α = | 2.00 | | | | | | | | | α = 8 | 3.40 | | | | |
| 0.017 .033 .067 .100 .133 .306 .367 .433 .500 .567 .633 .767 .800 .833 .767 .800 | .1809 .1048 .0701 .0461 0262 0599 0830 0669 0734 | .1835 .1077 .0776 .0319 0313 0585 0605 0780 0780 0643 0731 1003 1227 | .1765 .1031 .0722 .0278 0359 0629 0880 0629 0823 0668 0716 | .0931 .0601 .0329 .0420 .0692 .0964 -0682 .0741 -0974 -1246 -1363 .0818 .0513 .0853 .1145 .1524 | .1610 .0867 .0529 .0278 -0475 -0736 -0996 -0697 -0861 -0707 -0707 -0707 -0948 -1189 -1296 | 0.2098 .1475 .0795 .0435 .0251 -0527 -0741 -0952 -0712 -0838 -0692 -1178 -1178 -0562 .0951 .1174 .1524 .1437 | .1437 .0761 .0413 .0220 0552 0765 0958 0726 0842 0687 | .1398 .0776 .0348 .0154 0507 0741 0682 0682 0653 0653 0682 0916 1129 | 0.1958 .1427 .0799 .0404 .0182 .0494 -0753 .0900 .0668 .0649 -0909 .1093 .1151 -0552 .0587 .0954 .1205 .1237 | .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 | .2863 .1998 .1517 .1248 .0575 0040 0367 0272 0386 0454 | 0.3257 .2646 .1763 .1366 .0871 .0328 -0215 -0545 -0613 -0613 -0720 .1049 -1321 -1680 .0250 .0619 .0910 .1531 .1841 | .2116 .1288 .0941 .0412 0127 0599 0926 0762 0926 0888 | .1501 .0706 .0357 .0047 0642 1069 1127 1273 1166 1224 1476 1699 | .0999 .0268 0050 0310 0984 1330 1581 1244 1388 1196 | .0095 0244 0400 1117 1350 1486 1176 1234 1059 1049 1049 | .0672 .0133 0156 0291 1042 1157 1176 0926 0945 0753 0695 | 0.1210 .0745 .0289 .0070 .0225 .0982 .0982 .1049 .0797 .0875 .0729 .0769 .1185 .1098 .0367 .0716 .0968 .1482 .1647 | |

NACA

TABLE I .- Continued

(h) M = 1.02.

| | | | | α = | -2.3° | | | | | • | | 195 | | α = 1 | +.1° | | | | |
|---|--|--|---|--|--|--|--|--|---|---|---|--|---|--|--|---|--|--|---|
| x/l | A | В | C | D | E | F | O- | н | I | x/l | A | В | С | D | E | F | G | н | I |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .700 .700 .733 .767 .800 .833 .867 .900 | 0.1958 .1501 .0815 .0491 .0291 -0394 -0689 -0774 -0889 -0766 -0899 -0813 -0518 .0444 1034 .1663 .1634 | .0855 .0578 .0187 -0424 -0662 -0901 -0767 -0862 -08062 -0862 -0876 0445 .1370 | .1027 | 0.2114 1656 .0941 .0626 .0357 -0626 .0738 -0738 -0939 -0834 -0939 -0872 -0939 -0681 .0397 1007 1341 11675 1570 | 0.2277 .1790 .1046 .0731 .0445 -0262 -0615 -0939 -0853 -0977 -0901 -0958 -1054 -0834 0330 .0979 .1342 1695 .1590 | 0.2438 .1866 .1141 .0769 .0569 -0176 -0538 -0834 -0710 -0815 -0958 -0958 -1082 -0948 .0282 .1007 .1312 .1723 .1618 | 0.2602 .2019 .1275 .0884 .0674 -0061 -0462 -0777 -0662 -0834 -0805 -0939 -0910 -0958 -1130 -0176 .0951 .1294 1733 .1647 | 0.2715 .2114 .1370 .0893 .0663 .0405 -0567 -0786 -0757 -0929 -0920 -0977 -1139 -1101 .0177 .0902 .1284 1732 .1647 | 0.2745 .2134 .1380 .0903 .0683 .0073 -0405 -0766 -0766 -0767 -0930 -0920 0178 .0893 .1275 .1733 .1647 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .563 .700 .733 .767 .800 .833 .867 .900 | 0.2984 2303 .1512 .1064 .0826 .0158 -0347 -0652 -0575 -0747 -0776 -0938 -0957 -1014 -1214 -1262 -0023 .0806 .1178 .1674 .1731 | 0.2798 2303 .1483 .1140 .0663 .0072 -0347 -0690 -0576 -0843 -0957 -1052 -1090 -1262 -1319 -0072 .0854 1235 1693 .1693 | 1016 | .1902 .1121 .0749 .0473 .0233 .0976 0776 .1071 1062 1109 1109 .11043 .0263 | 0.2193 .1668 .0913 .0560 .0321 -0386 -0739 -1045 -0825 -1046 -0969 -1036 -1074 -0806 .0350 .0980 .1314 .1639 .1563 | 0.2017 1521 .0816 .0444 .0263 -0461 -0766 -1014 -0881 -1014 -0947 -1005 -0957 | .1400 .0741 .0374 .0034 .0520 .0768 .0978 .0825 .0959 .0844 .0921 .0844 .0873 .0864 .0501 | 0.1893 .1397 .0797 .0377 .0187 .0461 .0719 .0890 .0766 .0938 .0823 .0881 .0785 .0862 .0862 .0850 .0950 .1026 .1321 .1616 .1597 | 0778 0825 .0493 .1018 |
| | | | | α = | -0.2° | | | | | | | | | α = 6 | 6.2° | | | | |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .767 .800 .833 .867 .900 | 0829 0875 0799 0971 0913 0961 1009 0818 .0271 .0940 .1303 .1676 | .1755 .1028 .0732 .0312 0291 0596 0873 0701 0940 0902 0950 1026 0813 0911 0991 0950 1026 0813 0813 0813 0911 0914 | 0311 0608 0876 0704 0915 0780 0953 0905 0934 1039 0838 .0265 .0955 .1310 | .1783 .1047 .0703 .0445 0271 0606 0912 0711 0950 0883 0959 1026 0807 .0312 .0952 .1315 | 0.2278 .i780 .1041 .06770447 -0272 -0608 -0963 -0915 -0809 -0963 -0886 -0972 -1049 -0848 .0245 .0926 .1310 .1674 | 0.2347 .1831 .1095 .0703 .0512 -0233 -0577 -0854 -0730 -0893 -0816 -0950 -0873 -0940 -0854 -0312 0990 1315 .1707 .1611 | 0.2345 .1827 .1089 .0687 .0504 -0244 -0589 -0857 -0733 -0856 -0806 -0953 -0876 -0953 -0876 .0255 .1300 .1693 .1597 | 0.2414 1841 1143 .0694 .0474 -0166 -0558 -0797 -0673 -0883 -0797 -0950 -0893 -0952 -0864 .0312 .0952 1315 .1697 .1592 | .1808 .1118 .0677 .0466 -0176 -0560 -0880 -0675 -0780 -0953 -0886 -0963 -1068 -0963 -1068 -0925 ,0926 -1300 .1693 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .733 .700 .733 .767 .800 .833 .867 .900 | 0.3267 .2637 .1788 .1330 .0385 .0177 .0521 .0628 .0654 .0731 .0902 .0969 .1074 .1294 .1294 .0710 .1053 .1616 .1893 | 1502 0157 .0722 .1094 .1619 | .2176 .1363 .1029 .0512 .0042 .0836 .0721 .0979 .0941 .1132 .1151 .1170 .1447 .0061 .0771 .11660 | .0989 .0626 .0340 .0347 .0787 .1149 .0958 .1187 .1264 .1235 .1283 .1397 .1207 .0168 .0874 .1247 .1628 | .1430 .0694 .0340 .0092 0597 0960 1266 1036 1247 1130 1161 1180 1170 .0369 .0924 .1239 .1612 | .0550 .0178 .0015 -0701 -1006 -1226 -1044 -1168 -1073 -1111 -0997 -0939 -0939 -0538 .0416 .0960 | .1124 .0493 .0159 .0006 -0711 -0922 -1094 -0931 -1017 -0893 -0845 -0845 -0845 -0845 -10472 .0398 .0933 .1201 .1593 | .0569 | 1.124 .0579 .0579 .0207 .0015 .0616 .0797 .0922 .0778 .0807 .0740 .0807 .0740 .0415 .0465 .0933 .1191 .1535 |
| ** | | | | α = | 1.9° | | | | | | | | | a. = | 8.5° | | | | 1 |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .760 .800 .833 .867 .903 | .1955 .1180 .0817 .0587 .0587 .0587 .0659 .0809 .0809 .0809 .0953 .1020 .1020 .0993 .0953 .1058 .0993 .1058 .0993 .1058 .0993 .1058 | .2037 .1255 .1255 .0931 .0492 .0109 .0109 .0766 .0624 .0776 .0776 .0939 .0939 .0939 .0939 .0939 .0939 .1233 .1233 .1233 .1233 .1233 | .1914 .1147 .0840 .0399 0205 0541 0848 0694 0809 0982 0982 1164 1039 .0169 .0888 .1271 1.1664 | .1885 .1122 .0759 .0511 0567 0900 0691 0924 0958 0950 0967 1063 | .1741 .0993 .0639 .0399 0320 0963 0963 0975 0991 0991 0995 0991 1059 0848 .0265 | .1694 .0988 .0607 .0425 0309 0633 0910 0939 0824 0939 | .1607 .0888 .0514 .0341 0397 0685 0943 0838 0943 0933 0838 0924 0972 0704 .0341 .0993 .1300 | .1608 .0969 .0540 .0330 0633 0843 0719 0900 0786 0900 0815 0900 0605 .0444 .1266 .1360 .1684 | .0917 .0495 .0303 .0359 .0675 .0752 .0915 .0809 .0915 .0915 .0646 .0380 .0974 .1310 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .700 .733 .767 .800 .833 .867 | 1324 1553 0540 .0672 .1006 | .2809 .1913 .1550 .0997 .0463 -0109 -0490 -0490 -0776 -0948 -1100 -1205 -1444 -1634 -0395 0702 | .2237 .1394 .1040 .0532 .0013 .0550 .0904 .0818 .1086 .1067 .1268 .1325 .1364 .1671 .1708 | .1665 .0845 .0473 .0177 .0481 .0967 .11405 .1405 .1501 .1482 .1510 .1666 .1465 .1001 .1666 .1465 .1760 | .1117 .0370 .0034 0224 0875 1278 1536 1392 1507 1392 1364 1287 .0341 .0916 .1287 .0341 | .0254 -0099 -0261 -0948 -1253 -1444 -1234 -1215 -1177 -1014 -0986 -0986 -0978 -0978 -1274 -1722 | .0791 .0236 080 0234 0923 1105 1220 1019 1096 0952 0942 0875 0954 0.0341 0.0341 0.0341 | .0940 .0406 .0063 -0109 -0738 -0861 -0986 -0862 -09948 -0948 -0948 -0948 -1043 -0929 -0624 -0292 -0788 -1112 -1646 | .0896 .0408 .0408 .0063 .0063 .0741 .0875 .0971 .0780 .0780 .0772 .0780 .0780 .0780 .0780 .0780 .0780 .0780 .0780 .0780 .0780 .0780 .0780 .0780 .0827 .0827 .0827 .0827 .0827 .0827 .0828 |

TABLE I .- Continued

PRESSURE COEFFICIENTS OF A 120-INCH FINENESS-RATIO-12 BODY OF REVOLUTION IN THE LANGLEY 16-FOOT TRANSONIC TUNNEL

(i) M = 1.05.

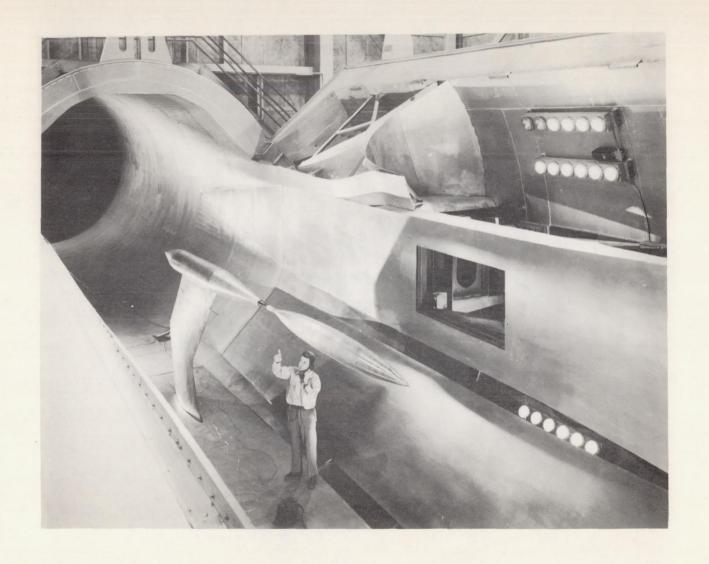
| | | | | α = | -2.3° | | | | | | | | | α = 4 | .1° | | | | |
|---|---|---|--|--|--|--|---|--|--|---|---|---|---|---|--|--|---|--|---|
| x/l | A | В | С | D | E | F | G | н | I | x/l | A | В | С | D | E | F | G | н | I |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .767 .800 .833 .867 .900 | 0.2138 .1691 .1114 .0881 .0723 .0034 -0348 -0734 -0870 -1000 .1131 -1196 -1326 -1242 -1028 -0348 .0760 .1505 .1971 .2036 | 0723 0648 0900 0984 1087 1152 1273 1217 1068 | 1198 1338 1329 1114 | .1835 .1229 .1004 .0771 .0062 -0349 -0779 -0667 -0928 -1021 -1171 -1199 -1376 -1329 -1161 | .1928 .1293 .1079 .0845 .0146 0274 0769 0666 0937 1030 1217 1236 | 1189 1236 | 0.2703 2161 .1527 .1228 .1079 .0351 -0116 -0620 -0601 -0834 -0974 -1149 -1254 -1441 -1618 -1506 -0760 .0659 .1517 .2031 .2021 | .2302 .1695 .1294 .1107 .0463 | 0.2833 .2637 .1620 .1265 .1079 .0463 .0060 .0508 .0788 .0918 .1198 .1198 .1469 .1637 .1515 .0844 .0575 .1489 .2040 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .767 .800 .833 .867 .900 | .2456 .1748 .1431 .1236 .0565 0004 0488 0539 0731 0926 1215 1373 1532 | 0.2958 .2463 .1743 .1491 .061 .0473 -0527 -0499 -0807 -0929 -1200 -1321 -1489 -1723 -1676 -0966 .0604 .1968 .2061 | 0881 1003 1255 1367 1535 | 1349 | 0.2377 .1864 .1182 .0967 .0753 .0052 .0387 .0881 .1040 .1124 .1331 .1535 .1544 .1339 .0527 .0753 .1462 .1901 .1948 | 1003 1115 1246 1265 1414 | .1574 .1005 .0949 .0641 0097 0452 0844 0769 1059 1162 1180 1339 1274 | 0.2005 .1556 .1071 .0753 .0585 0069 0433 0807 0704 0929 1013 1115 1172 1312 1312 1312 1454 .1883 .1968 | 0.1957 .1509 .1023 .0734 .0584 -0060 -0396 -0797 -0685 -0909 -0993 -1087 -1143 -1152 -0275 -023 .1453 .1892 .2060 |
| | | | | α = | -0.2° | | | | | | | | | α, = 6 | 5.2° | | | | |
| 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .767 .800 .833 .867 .900 | 0.2362 1877 1253 1011 0745 0173 -0264 -0617 -0851 -1019 -1270 -1270 -1410 0676 1514 -2017 .2026 | .0155 0209 0647 0591 0862 0955 1123 1188 1337 1384 1235 0507 0.7099 1.582 2048 | .1937 .1321 .1125 .0761 .0164 -0190 -0881 -0984 -1152 -1217 -1376 -1450 -1273 .0696 .1536 .2031 | .1973 .1330 .1106 .0892 .0192 .0218 .0694 .0601 .0871 .0964 .1140 .1375 .1384 .1235 .0554 | 1984 .1331 .1116 .0901 .0202 0200 0713 0620 0890 0984 1161 1189 | .1992 .1395 .1106 .0966 .0229 -0181 -0638 -0610 -0824 -1132 -1172 | .1984 .1377 .0967 .0239 -0172 -0629 -0844 -0984 -1161 -1189 -1385 -1487 -1429 -0610 .0715 .1520 .2040 | .2067 .1498 .1153 .0957 .0313 0601 0563 0806 0946 11207 1393 1440 1300 | .2012 .1424 .1097 .0920 .0295 0153 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .733 .767 .800 .833 .867 .933 | .2809 .2073 .1700 .1468 .0806 .0155 -0320 -0298 0609 1149 1354 1755 1768 .0359 .1291 .1952 | .2743 .1977 .1697 .1248 .0688 .0127 0405 0405 0742 0882 | .1723 .1452 .1004 .0444 0088 0601 0592 1040 1320 1459 1889 1889 1040 .0519 .1377 .1377 | .2061 .1332 .1080 .0828 .0136 0919 0826 1125 12180 1751 1751 1874 1741 0845 .0650 .1379 .1865 | .1713 .1023 .0808 .0566 0125 0592 1077 0937 1217 1282 1487 1487 1609 1376 | .1444 .0856 .0585 .0454 0256 0658 1041 0966 1162 1256 1358 1349 1461 | 0610 0937 0853 1021 1096 1152 1180 1208 1002 0274 .0696 .1340 .1891 | 0.1771 .1342 .0893 .0604 .0463 -0200 -05085 -0751 -0947 -11022 -1097 -11181 -1330 -1162 -1059 -0312 .0604 .1276 .1809 .2136 | .0911 .0622 .0472 -0181 -0480 -0797 -0685 -1030 -1956 -1030 -1245 -1021 -0984 -0218 .0705 |
| | | | | α = | 1.9° | 4 | | | | | | | | α = | 8.5° | | | | |
| .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 | .1486 .1216 .1030 .0359 -0153 -0590 -0615 -0786 -1954 -1205 -1308 -1457 -1540 -1401 -0777 0639 .1514 .2045 | .2171 .1499 .1266 .0892 .0323 .0060 .0556 .0536 .0946 .0946 .1170 .1438 .1264 .1590 .1590 .1590 .1490 .1490 .1490 | . 2152 . 1489 . 1265 . 0873 . 0286 . 0134 0620 0564 1853 0956 1180 1254 1413 1422 0685 0685 1545 0685 1545 0685 1545 0685 06 | . 2059 .1368 .1126 .0920 .0230 .0666 .0601 .0881 .0984 .1126 .11450 .11450 .1155 .1566 .15 | .1321 .1097 .0883 .0174 0246 0741 0638 0900 1180 1208 1413 1450 1273 0536 0743 1.1545 | .1835 .1247 .0958 .0846 .0136 0228 0666 0872 1012 1161 1198 1385 1243 1266 0517 .0706 | .1797 .1219 .0957 .0836 .0099 -0293 -0722 -0676 -0881 -0993 -1138 -1156 -1329 -0368 -0817 -0368 -0817 -0368 -0817 -0368 | .1798 .1266 .0920 .0762 .0136 0246 0676 0629 0862 1142 1142 11357 1357 1357 1357 1499 1499 | .1779 .1228 .0920 .0761 .0127 .0284 .0741 .0629 .0872 .0974 .1124 .1142 .1366 .1273 .1077 .0321 .0789 .1555 .2003 | 0.017 .033 .067 .100 .133 .167 .233 .300 .367 .433 .500 .567 .633 .700 .733 .767 .800 .833 .867 .933 | .3253 .2453 .2025 .1783 .1122 .0369 0106 0075 0422 0664 1009 1260 1446 1753 1223 3.0313 .1346 | .3092 .2280 .1963 .1473 .0938 .0301 025 0619 0778 1113 152 1866 194 1266 .0203 .1311 .2089 | .1869 .1552 .1059 .518 0097 0600 0600 0936 1157 1718 1718 1718 1978 1958 1455 1455 | .2019 .1246 .0966 .0695 .0034 0572 1011 1309 1402 1682 1747 1943 2027 2027 0964 .0481 .1469 | .1524 .0816 .0583 .0304 -0358 -0889 -1327 -1187 -1790 -1672 -1783 -1625 -1336 -0367 .0704 .1506 | 1272 1160 1328 1402 1449 1384 1402 1067 0668 .1423 | .1133 .0630 .0397 .0248 .0479 .0805 .1029 .1029 .1029 .1122 .1129 .1126 .1131 .0982 .0246 .0723 .1422 | 0955 1048 1160 1281 1430 1225 1216 0489 .0481 .1236 .1954 | .1236 .0816 .0369 .0379 .0535 .0786 .0637 .0814 .0889 .0936 .1029 .1029 .1033 .0846 .0982 .0982 .1955 .1329 |

NACA

TABLE I .- Concluded

(j) M = 1.09.

| | | | | α = - | -2.4° | | | | | | | | | α = | 4.10 | | | | |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------|------|--------------|--------------|--------|--------|--------|--------|---------|--------------|-------|
| x/l | A | В | C - | D | Е | F | G | Н | I | x/l | А | В | С | D | E | F | G | Н | I |
| .017 | 0.2011 | 0.2014 | 0.1968 | 0.2253 | 0.2263 | 0.2557 | 0.2576 | 0.2869 | 0.2788 | | 0.2940 | 0.2798 | 0.2668 | 0.2504 | 0.2245 | 0.2080 | 0.1913 | 0.2006 | 0.189 |
| .033 | .1634 | .1682 | .1646 | .1830 | . 1849 | .2069 | .2097 | .1958 | .2235 | .033 | .2398 | .2366 | .2235 | .2034 | .1821 | .1656 | .1526 | .1564 | .146 |
| .067 | .1064 | .1103 | .1048 | .1130 | .1131 | .1333 | .1379 | .1176 | .1085 | .100 | .1157 | .1306 | .1186 | .0965 | .0790 | .0615 | .0532 | .0560 | .049 |
| .133 | .0577 | .0477 | .0422 | .0670 | .0689 | .0882 | .0919 | .1020 | .0974 | .133 | .1083 | .0892 | .0771 | .0754 | .0615 | .0588 | .0541 | .0486 | .04 |
| .167 | .0145 | .0017 | .0017 | .0140 | .0210 | .0145 | .0201 | .0578 | .0578 | .167 | .0633 | .00413 | .0330 | .0238 | .0127 | 0168 | 0158 | .0072 | 026 |
| .233 | 0305 | 0241 | 0241 | 0241 | 0195 0536 | 0103 | 0039 | .0090 | .0099 | .233 | 0223 | 0297 | 0324 | 0564 | 0582 | 0610 | 0536 | 0573 | 052 |
| .367 | 0262 | | 0499 | 0278 | 0315 | 0306 | 0278 | 0195 | 0195 | .367 | 0084 | 0177 | 0204 | 0361 | 0370 | 0444 | 0370 | 0333 | 029 |
| .433 | 4.0081 | 0048 | .0090 | .0044 | .0090 | .0320 | .0044 | .0477 | 0011 | .433 | .0743 | .0625 | .0587 | .0284 | .0238 | .0053 | .0109 | .0044 | .01: |
| .500 | 0425 | 0490 | 0370 | 0664 | 0517 | 0545 | 0296 1088 | 0434 | 0195 | .500 | 0397 1114 | 0426 | 0407 | 0748 | 0702 | 0693 | 0563 | 1024 | 09 |
| .633 | 0921 | 0931 1226 | 0932 | 1069 1309 | 1088 | 1152 1318 | 1318 | 1171 | 1291 | .633 | 1363 | 1402 | 1420 | 1457 | 1420 | 1365 | -: 1254 | 1255 | 118 |
| .700 | 1481 | 1447 | 1493 | 1557 | 1622 | 1594 | 1622 | 1649 | 1659 | .700 | 1684 | 1678 | 1677 | 1770 | 1714 | 1595 | 1475 | 1494 | 142 |
| .733 | 1536 | 1520 | 1622 | 1576 | 1733 | 1796 | 1880 | 1852 | 1889 | .733 | 1887 | 1945 | 1935 | 1909 | 1788 | 1641 | 1493 | 145(| 13 |
| .767 | 1426 | 1428 | 1521 | 1539 1069 | 1714 | 1695 | 1852 1337 | 1898 | 1963 | .767 | 1979 | 1476 | 1401 | 1338 | 1162 | 1034 | 0959 | 0941 | 089 |
| .833 | 0627 | 0444 | 0591 | | 0757 | 0609 | 0784 | 0766 | 0858 | .833 | 0967 | 0914 | 0867 | 0794 | 0646 | 0573 | 0527 | 0582 | 05 |
| .867 | 0020 | .0099 | 0057 | .0164 | 0039 | .0090 | 0177 | .0035 | 0232 | .867 | 0186 | 0140 | 0039 | .0035 | .0072 | .0247 | .0053 | .0044 | .00 |
| .900 | .0788 | .0992 | .0808 | .0964 | .0827 | .1001 | .0873 | .1103 | .0900 | .900 | .0945 | .0984 | .0956 | .1269 | .1250 | .1232 | .1232 | .1288 | .13 |
| .933 | .1211 | .1351 | .1158 | .1305 | .1167 | .1333 | .1195 | .1379 | .1232 | .933 | .1301 | .1300 | .1324 | | | .225 | 1.25 | | |
| | | | | α = | -0.2° | | | | | | | | | α = | 6.2° | | | | |
| .017 | 0.2240 | 0.2190 | 0,2236 | | | 0.2457 | 0.2447 | 0.2595 | 0.2539 | | 0.3297 | 0.3144 | 0.2815 | 0.2500 | 0.2060 | 0.1829 | 0.1609 | 0.1755 | 0.16 |
| .033 | .1799 | | .1885 | .1895 | .1950 | .1978 | .2014 | .2042 | .2060 | .033 | .2709 | .1893 | .1609 | .1231 | .0882 | .0799 | .0716 | .0918 | .08 |
| 100 | .1193 | .1214 | .1250 | .1195 | .1278 | .1278 | .1324 | .0956 | .0928 | .100 | .1432 | .1562 | .1305 | .0937 | .0606 | .0440 | .0330 | .0431 | .03 |
| 133 | .0678 | .0560 | .0587 | .0735 | .0762 | .0827 | .0864 | .0836 | .0827 | .133 | .1340 | .1121 | .0827 | .0679 | .0422 | .0394 | .0357 | .0375 | 00 |
| 167 | .0255 | .0099 | .0145 | .0210 | .0265 | .0081 | .0118 | .0403 | .0403 | .167 | .0862 | .0605 | .0385 | .0173 | 0057 | 0351 | 0333 | 0057 | 03 |
| .233 | 0250 | 0195 | 0131 0398 | 0195 | 0131 | 0140 | 0085 | 0076 | 0398 | .233 | 0066 | 0167 | 0342 | 0655 | 0784 | - 0747 | 0646 | 0591 | 05 |
| .300 | 0293 | 0287 | 0223 | 0306 | 0260 | 0306 | 0260 | 0287 | 0232 | .367 | 0 | 0085 | 0250 | 0462 | 0563 | 0526 | 0444 | 0223 | 026 |
| .433 | .0210 | .0118 | .0210 | .0192 | .0330 | .0366 | .0477 | .0486 | .0495 | .433 | .0577 | .0743 | .0403 | .0145 | 0075 | 0167 | 0131 | 0223 | 00 |
| .500 .567 | 0507 | 0499 | 0425 | 0646 | 0591 1051 | 0545 | 0444 | 0508 1162 | 1107 | .567 | 1022 | 1097 | 1171 | 1400 | 1355 | 1244 | 0996 | 0977 | 088 |
| .633 | 1279 | 1319 | 1282 | 1337 | 1272 | 1291 | 1254 | 1309 | 1235 | .633 | 1344 | 1400 | 1549 | 1603 | 1622 | 1455 | 1263 | 1235 | 116 |
| .700 | 1536 | 1558 | 1512 | 1604 | 1567 | 1586 | 1530 | 1622 | 1567 | .700 | 1702 | 1713 | 1816 | 1934 | 1880 | 1621 | 1493 | 1400 | 130 |
| ·733 | 1601 1527 | 1678 1613 | 1631 | 1696 1632 | 1677 | 1733 | 1687 1641 | 1742 | 1631 | .767 | 2134 | 2201 | 2239 | 2090 | 1816 | 1455 | 1392 | 1373 | 13 |
| .800 | 1068 | 1088 | 1070 | 1162 | 1125 | 1144 | 1107 | 1355 | 1116 | .800 | 1702 | 1621 | 1622 | 1437 | 1189 | 1014 | 1015 | 1354 | 09 |
| .833 | 0618 | 0628 | 0609 | 0702 | 0655 | 0692 | 0665 | 0757 | 0702 | .833 | 1077 | 1032 | 1005 | 0830 | 0674 | 0572 | 0628 | 0094 | 06 |
| .867 | -,0081 | .0053 | .0109 | .0044 | .0090 | .0035 | .0081 | 0002 | .0053 | .867 | 0397 | 0296 | .0827 | .0863 | .0762 | .0835 | .0725 | .0771 | .06 |
| .900 | .1046 | .1343 | .1379 | | .1398 | .1352 | .1389 | .1361 | .1398 | -933 | .1514 | .1516 | .1361 | .1332 | .1241 | .1305 | .1250 | .1387 | . 149 |
| | | | | α = | 1.9° | | | | | | 12 | | | α = | 8.5° | | | | |
| .017 | 0.2563 | 0.2513 | 0.2484 | 0.2476 | 0.2383 | 0.2301 | 0.2226 | 0.2301 | 0.2272 | | 0.3738 | 0.3503 | 0.2970 | | | 0.1525 | 0.1332 | 0.1516 | 0.14 |
| .033 | .2067 | .2117 | .2088 | | .1950 | | .1830 | | | .033 | .3094 | .2979 | .2510 | .1948 | .1369 | .1111 | .1019 | .0762 | |
| .067 | .1433 | .1454 | .1425 | .1352 | .1315 | .1205 | .1167 | .1251 | | .100 | .1762 | .1810 | .1341 | .0835 | .0357 | .0173 | .0164 | .0302 | .02 |
| 100 | .0780 | .1104 | .0689 | .0772 | .0725 | .0735 | .0716 | | .0652 | .133 | .1624 | .1341 | .0845 | .0559 | .0136 | .0127 | .0173 | .0256 | .02 |
| 167 | .0412 | .0256 | .0256 | .0256 | .0238 | 0002 | 0002 | .0219 | .0238 | .167 | .1119 | .0808 | .0403 | .0044 | 0342 | 0618 | 0517 | 0177 | |
| 233 | 0149 | | 0057 | 0158 | 0149 | 0204 | 0168 | 0186 | 0131 | .233 | .0384 | .0357 | 0011 | 0453 | | 0968 | 0719 | 0600 | 05 |
| 300 367 | 0333 | 0370 | 0342 | 0508 | 0462 | | 0278 | 0315 | 0260 | .367 | .0314 | .0017 | 0305 | 0627 | 0738 | 0563 | 0213 | 0048 | .00 |
| .433 | .0449 | .0302 | .0385 | .0219 | .0293 | .0192 | .0274 | .0210 | .0284 | .433 | .0834 | .0753 | .0247 | 0158 | | 0471 | 0296 | 0250 | |
| 500 | 0508 | 0490 | 0425 | 0674 | 0628 | 0628 | 0536 | 0591 | 0499 | .500 | 0140 | 0259 1041 | 0554 | 1115 | 1603 | 1363 | 0995 | 1069 | 08 |
| .567 .633 | 1096 | 1089 | 1033 | | 1070 1291 | 1107 | | 1080 1264 | 1199 | .633 | 1297 | 1391 | 1676 | 1842 | 1842 | 1529 | 1290 | 1336 | 13 |
| 700 | 1611 | 1605 | 1558 | 1641 | 1585 | 1549 | 1475 | 1540 | 1475 | .700 | 1656 | 1731 | 1952 | 2145 | 2017 | 1612 | 1465 | 1566 1409 | 13 |
| .733 | 1740 | 1789 | 1742 | 1752 | 1659 | 1605 | | 1549 | 1493 | .733 | 1913 | 2063 | 2265 | 2283 | 1971 | 1557 | 1409 | | 14 |
| .767 | 1740 | 1807 | 1742 | 1715 | 1604 | 1586 | 1475 | 1476 | 1420 | .767 | 2179 | 2320 | 2421 | | 1143 | 1051 | 1051 | 1115 | 09 |
| .800 | 1252 | 1245 | 1189 | 1209 | 1125 | 0591 | 0517 | 0591 | 0527 | .833 | 1150 | 1143 | 1106 | 0885 | 0664 | 0618 | 0655 | 0775 | |
| | .0035 | .0035 | .0090 | .0072 | .0136 | .0109 | .0164 | .0109 | .0155 | .867 | 0507 | 0480 | 0287 | 0057 | 0048 | .0085 | 0177 | .0259 | |
| .867 | | | | | | | | | | | | | | | | | | | |
| | .1074 | .1085 | .1094 | | .1066 | .1076 | .1048 | | .1048 | .900 | .1808 | .1737 | .1590 | .1470 | | .1433 | .1461 | .1553 | |



L-69735

Figure 1.- Downstream view of the test section of the Langley 16-foot transonic tunnel showing the 120-inch body installed.

Tunnel wall

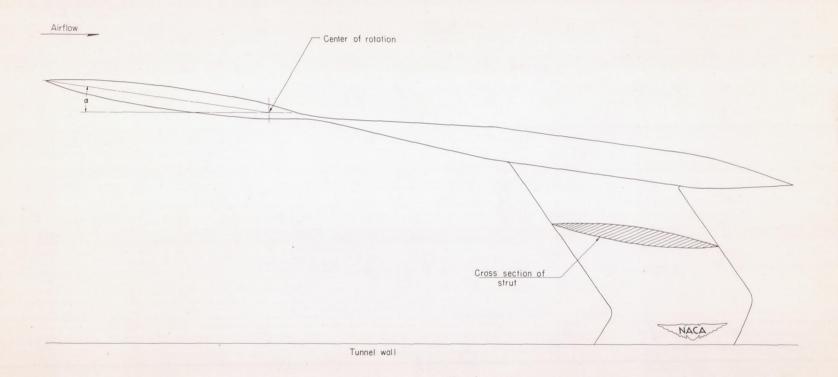
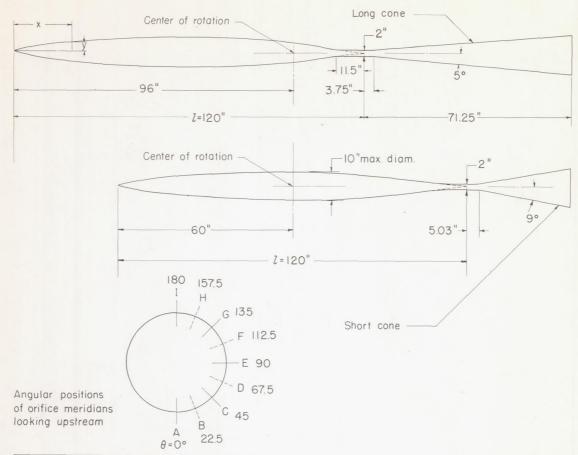


Figure 2.- Long sting configuration mounted on model support head and strut at angle of attack.

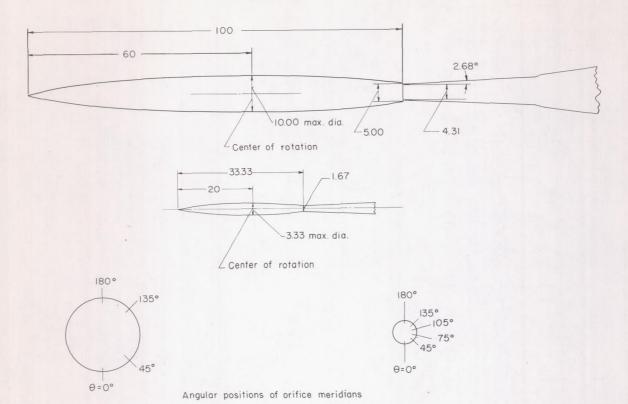


| Genero | al transonic f | uselage ord | dinates |
|---------|----------------|-------------|---------|
| x/l | y/l | x/l | y/Z |
| 0 | 0 | 0.4500 | 0.04143 |
| 0,005 | 0.00231 | .5000 | .04167 |
| .0075 | .00298 | .5500 | .04130 |
| .0125 | .00428 | .6000 | .04024 |
| .0250 | .00722 | .6500 | .03842 |
| .0500 | .01205 | .7000 | .03562 |
| .0750 | .01613 | .7500 | .03128 |
| .1000 | .01971 | .8000 | .0.2526 |
| .1500 | .02593 | .8333 | .02083 |
| .2000 | .03090 | .8500 | .01852 |
| .2500 | .03465 | .9000 | .01125 |
| .3000 | .03741 | . 9500 | .00439 |
| .3500 | .03933 | 1.0000 | 0 |
| .4000 | .04063 | | |
| Leading | edge radius | = 0.00051 | |

| Orifice locations | |
|-------------------|-------|
| x/Z | X/Z |
| 0.017 | 0.567 |
| .033 | .633 |
| .067 | .700 |
| .100 | .733 |
| .133 | .767 |
| .167 | .800 |
| .233 | .833 |
| .300 | .867 |
| .367 | .900 |
| .433 | .933 |
| .500 | |

(a) 120-inch body.

Figure 3.- Dimensions and details of models tested in Langley 16-foot transonic tunnel.



100-inch body

| Orifice | locations |
|------------|-----------|
| x/l l=120" | |
| 0.017 | 0.433 |
| .033 | .467 |
| .067 | .500 |
| .100 | .533 |
| .133 | .567 |
| .167 | .600 |
| .200 | .633 |
| .233 | .667 |
| .267 | .700 |
| .300 | .733 |
| .333 | .767 |
| .367 | .800 |
| .400 | |
| | |

33.33-inch body

| Orifice locations | |
|-------------------|--------|
| | |
| 0.0625 | 0.1625 |
| .1125 | .2125 |
| .1625 | .2625 |
| .2125 | .3125 |
| .2625 | .3625 |
| .3125 | .3875 |
| :3625 | .4125 |
| .4125 | .4375 |
| .4625 | .4625 |
| .5125 | .4875 |
| .5625 | .5125 |
| .6125 | .5325 |
| .6625 | .5625 |
| .7125 | .5875 |
| .7625 | .6125 |
| .8125 | .6375 |
| | .6625 |
| | .7125 |

NACA

(b) 100- and 33.33-inch bodies.

Figure 3.- Concluded.

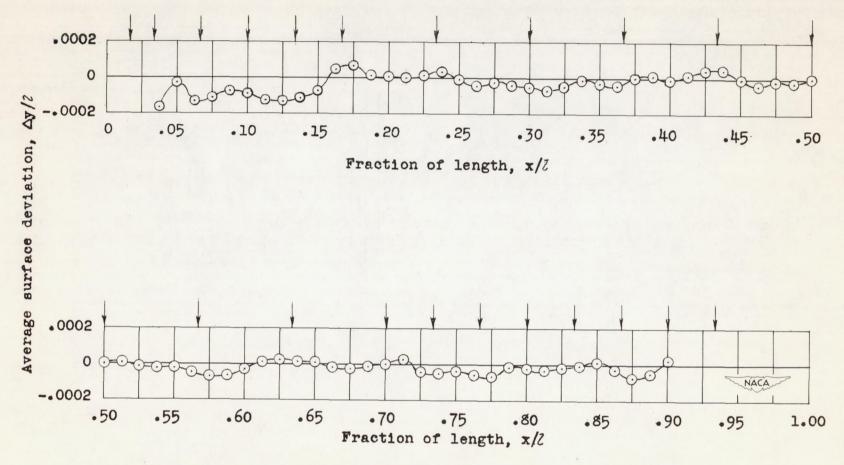
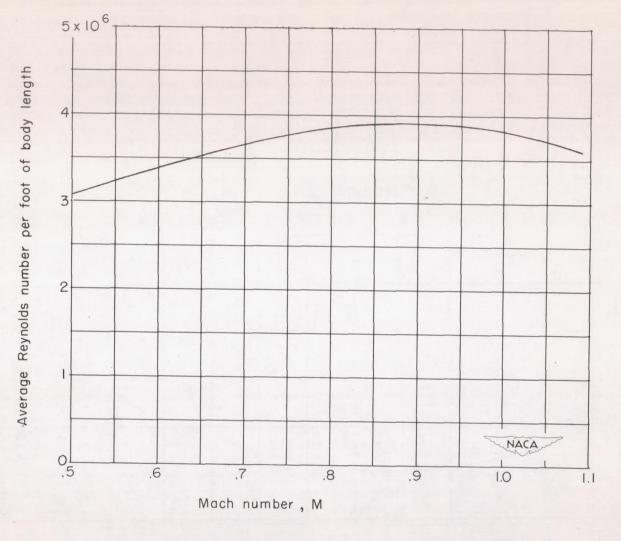


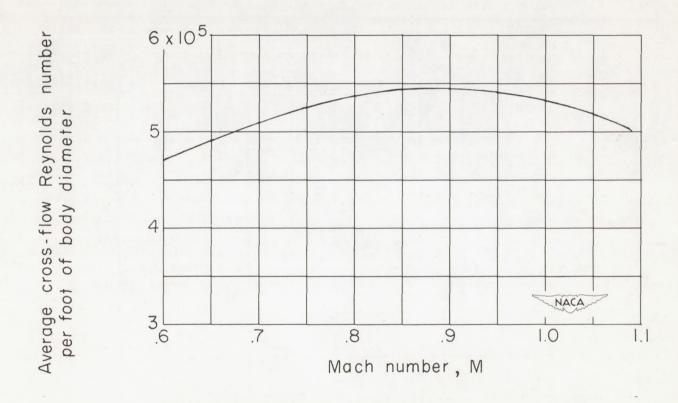
Figure 4.- Measured surface deviation along the 100-inch and 120-inch bodies from a faired curve. Arrows denote locations of pressure orifices of the 120-inch body.



(a) Reynolds number per foot based on body length.

Figure 5.- Variation of average Reynolds number with Mach number for tests in the Langley 16-foot transonic tunnel.

NACA RM L53HO4



(b) Cross-flow Reynolds number per foot based on maximum body diameter at 8° angle of attack.

Figure 5.- Concluded.

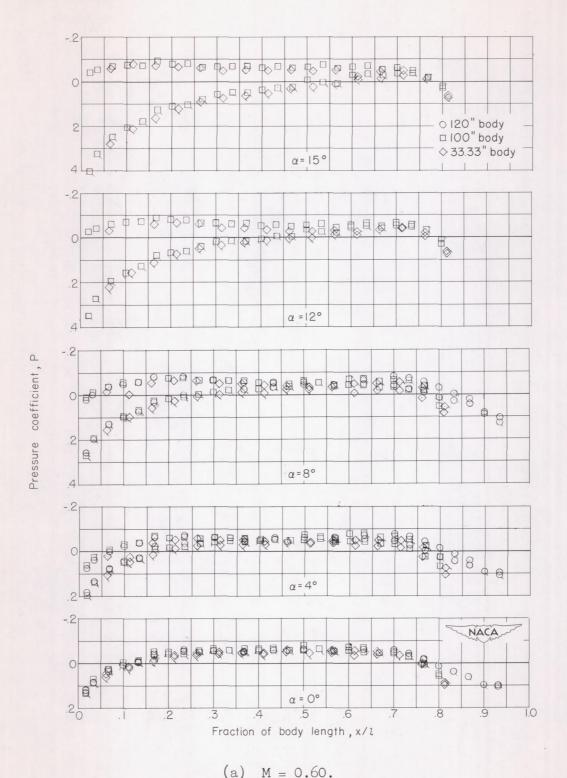
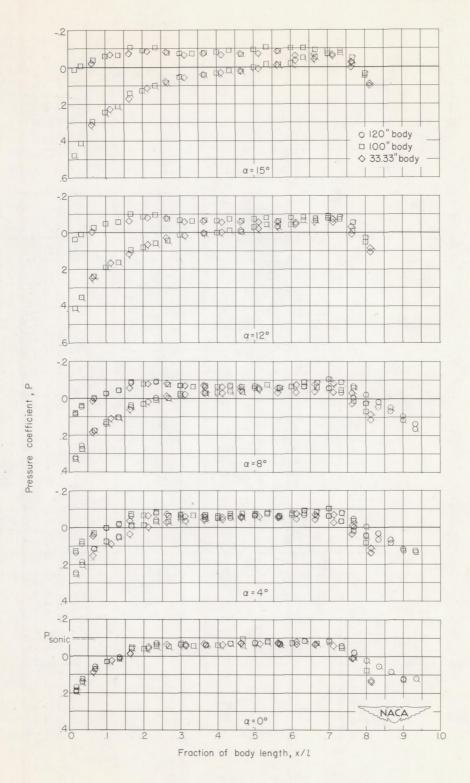
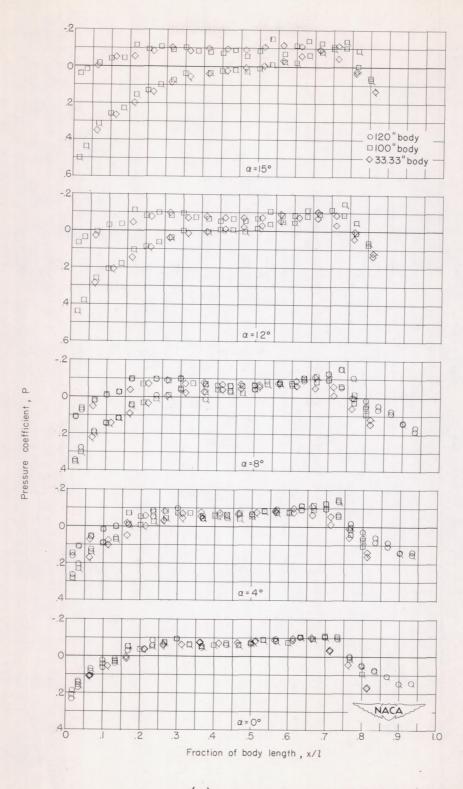


Figure 6.- Comparison of pressure coefficients over the three bodies with angle of attack. Plain symbols are 180° meridian and flagged symbols are 0° meridian.



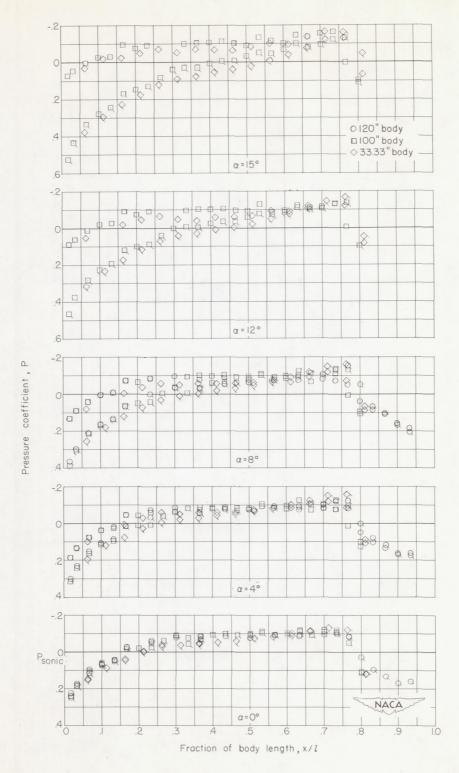
(b) M = 0.95.

Figure 6.- Continued.



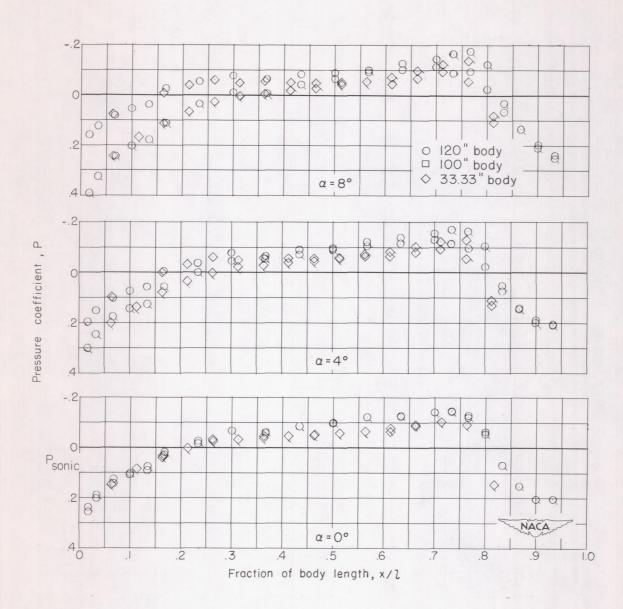
(c) M = 1.00.

Figure 6.- Continued.



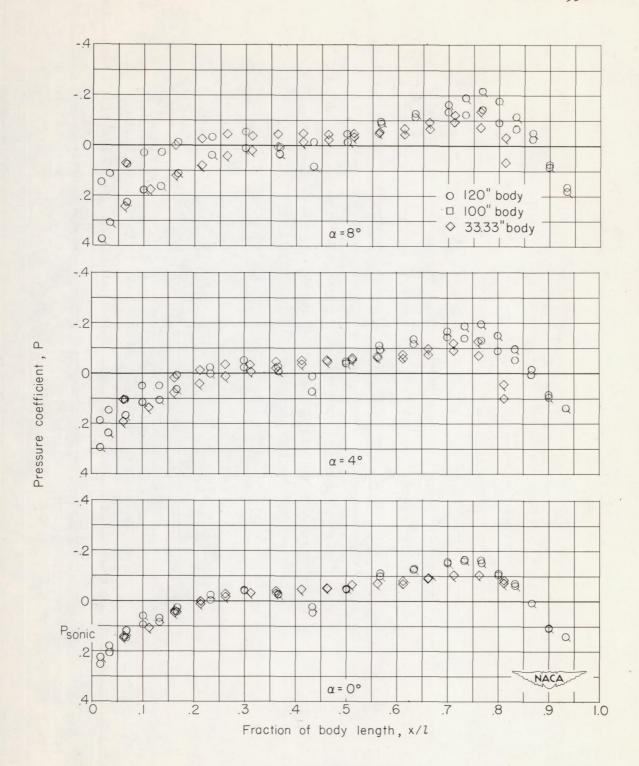
(d) M = 1.02.

Figure 6.- Continued.



(e) M = 1.05.

Figure 6.- Continued.



(f) M = 1.09.

Figure 6.- Concluded.

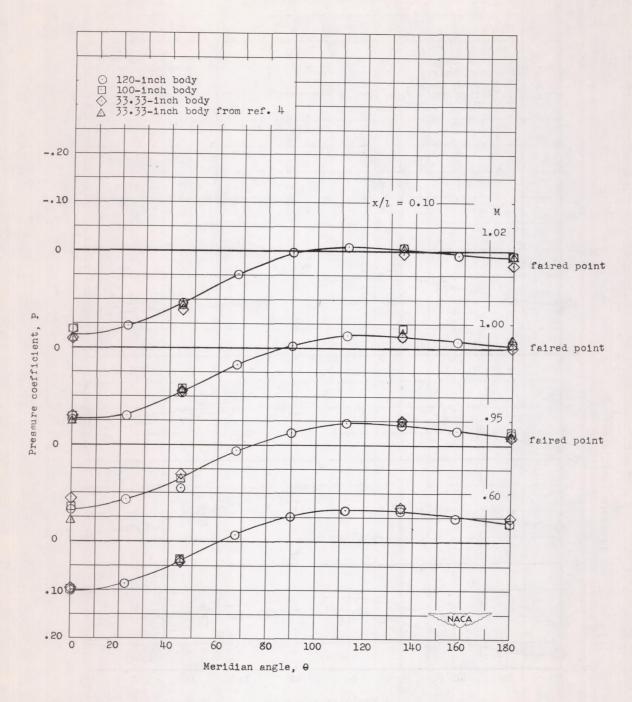


Figure 7.- Circumferential pressure distributions at one body station (x/l = 0.10) for four Mach numbers at 8° angle of attack.

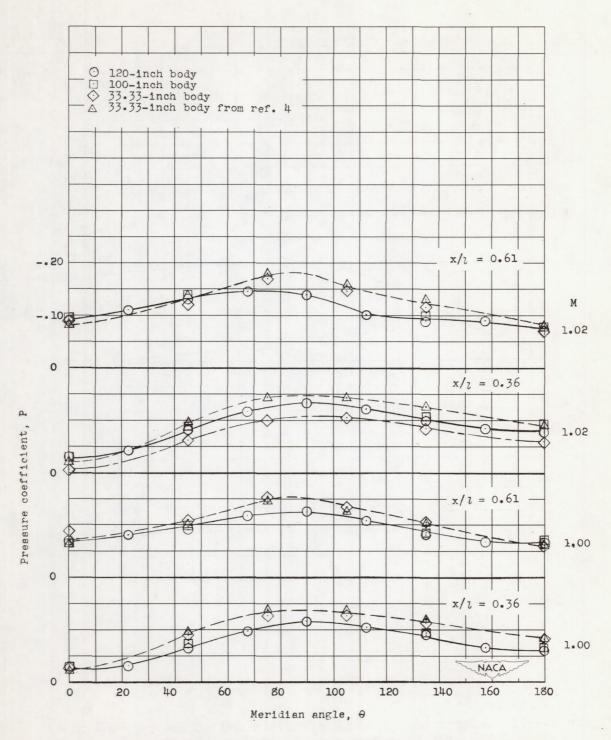


Figure 8.- Circumferential pressure distributions at two body stations (x/l = 0.36 and 0.61) for two Mach numbers at 8° angle of attack.

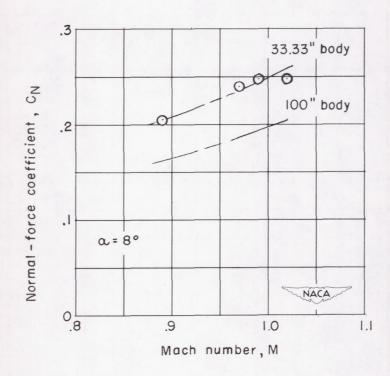


Figure 9.- Variation of the normal-force coefficient with Mach number of the 100- and 33.33-inch bodies at 80 angle of attack.

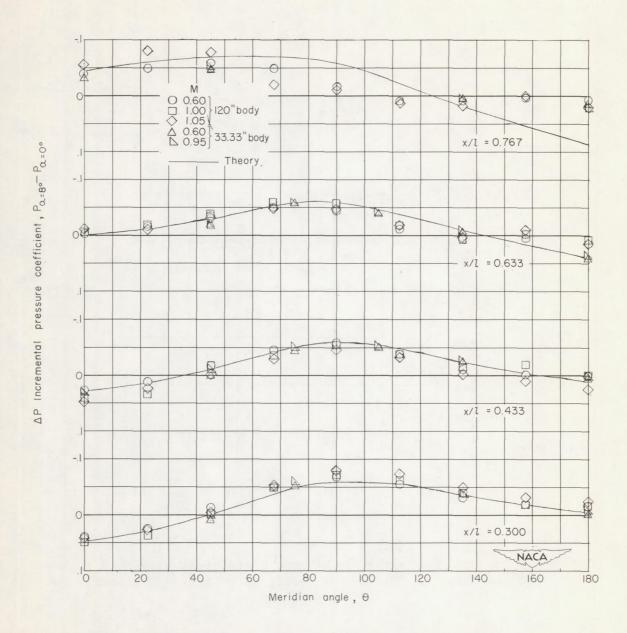


Figure 10.- Incremental-pressure-coefficient distribution with radial angle at 80 angle of attack for two different bodies.

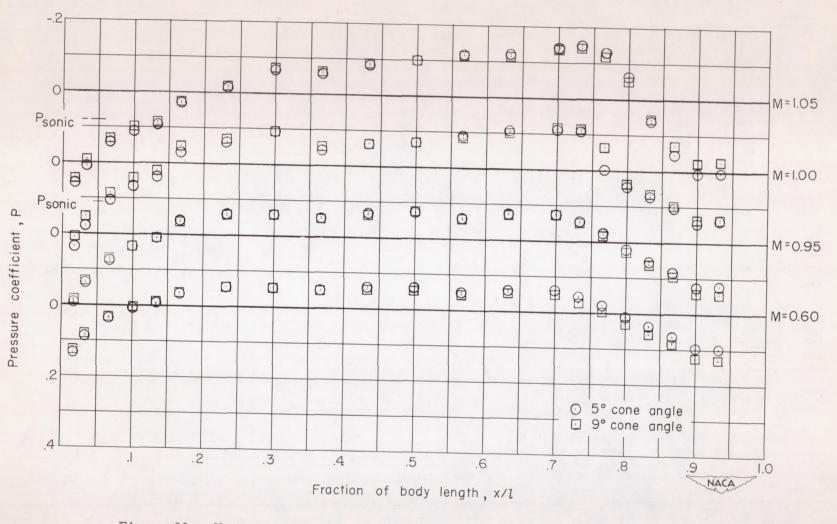


Figure 11.- Variation of pressure coefficient on the 120-inch body along the $180^{\rm O}$ meridian for the $5^{\rm O}$ and $9^{\rm O}$ string-cone angles with Mach number at $0^{\rm O}$ angle of attack.

